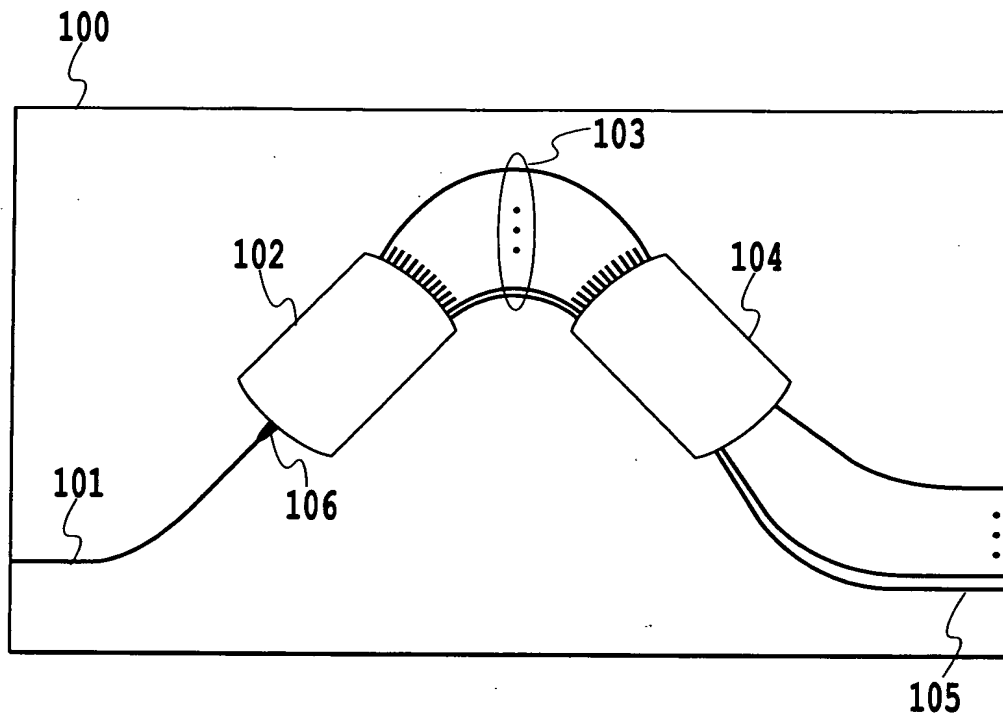


RELATED ART

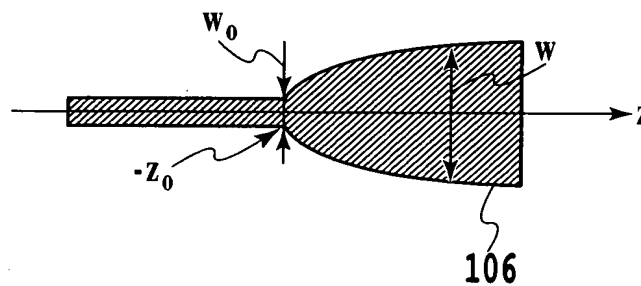
FIG.1



RELATED ART

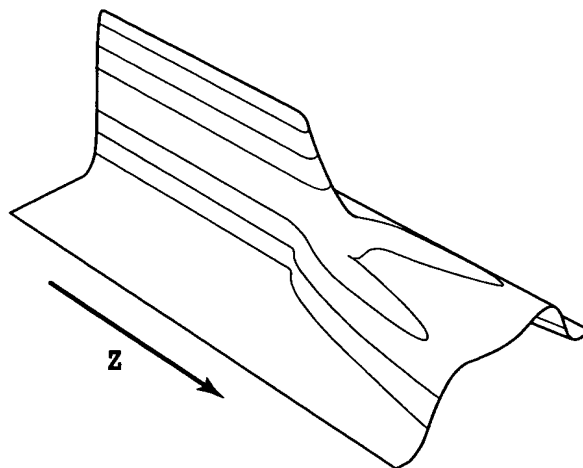
FIG.2A

$$z = A(w^2 - w_0^2) - z_0$$



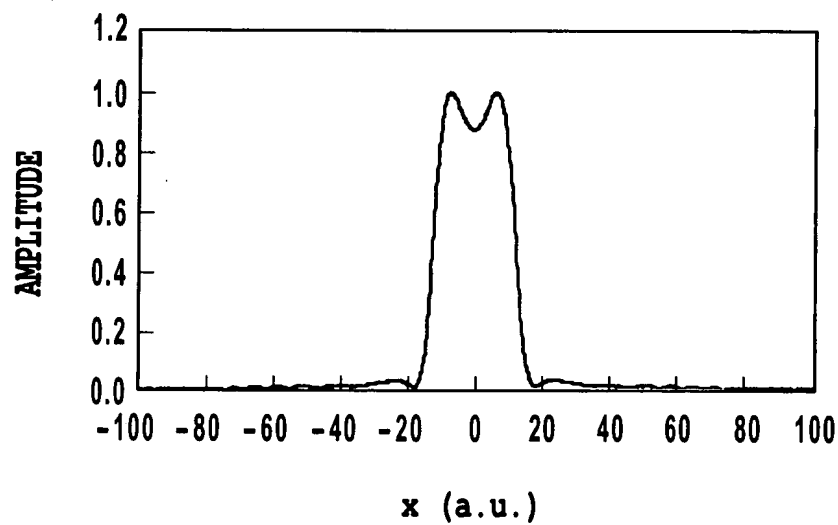
RELATED ART

FIG.2B



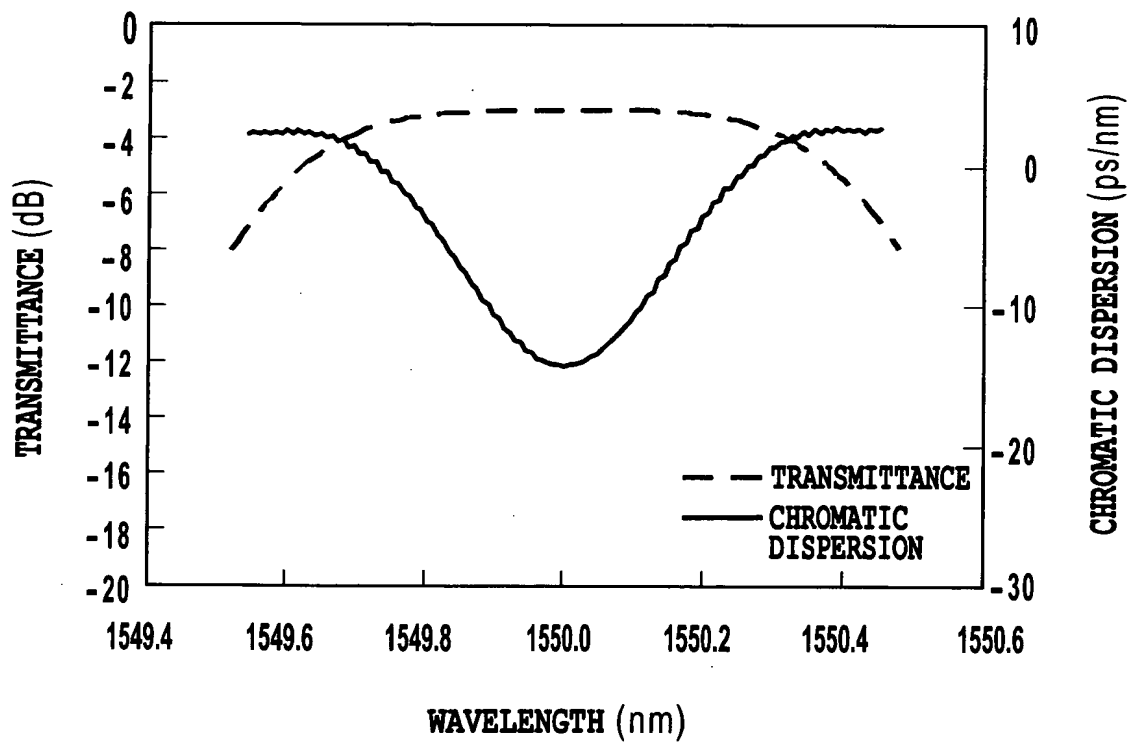
RELATED ART

FIG.3A



RELATED ART

FIG.3B

**RELATED ART****FIG.4**

5/70

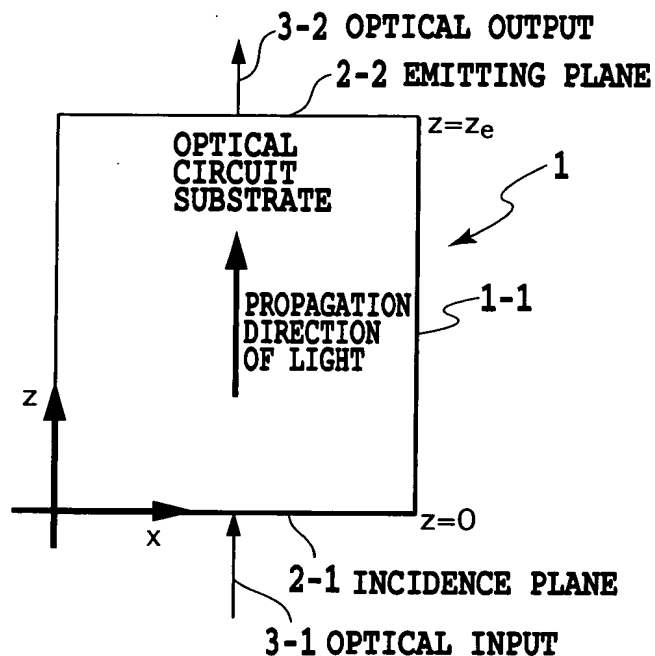


FIG. 5A

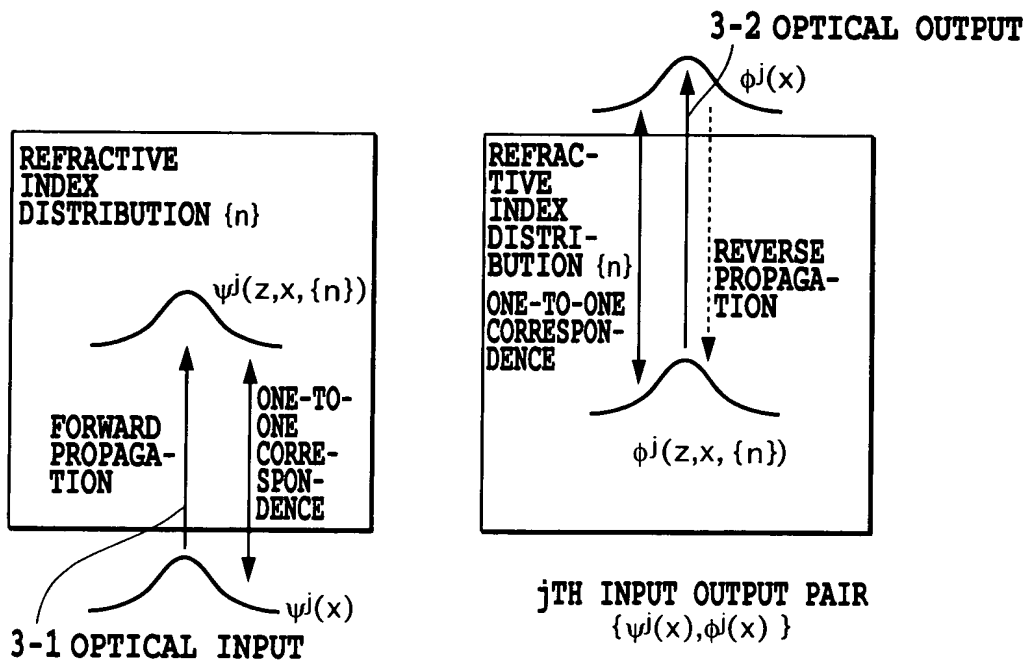
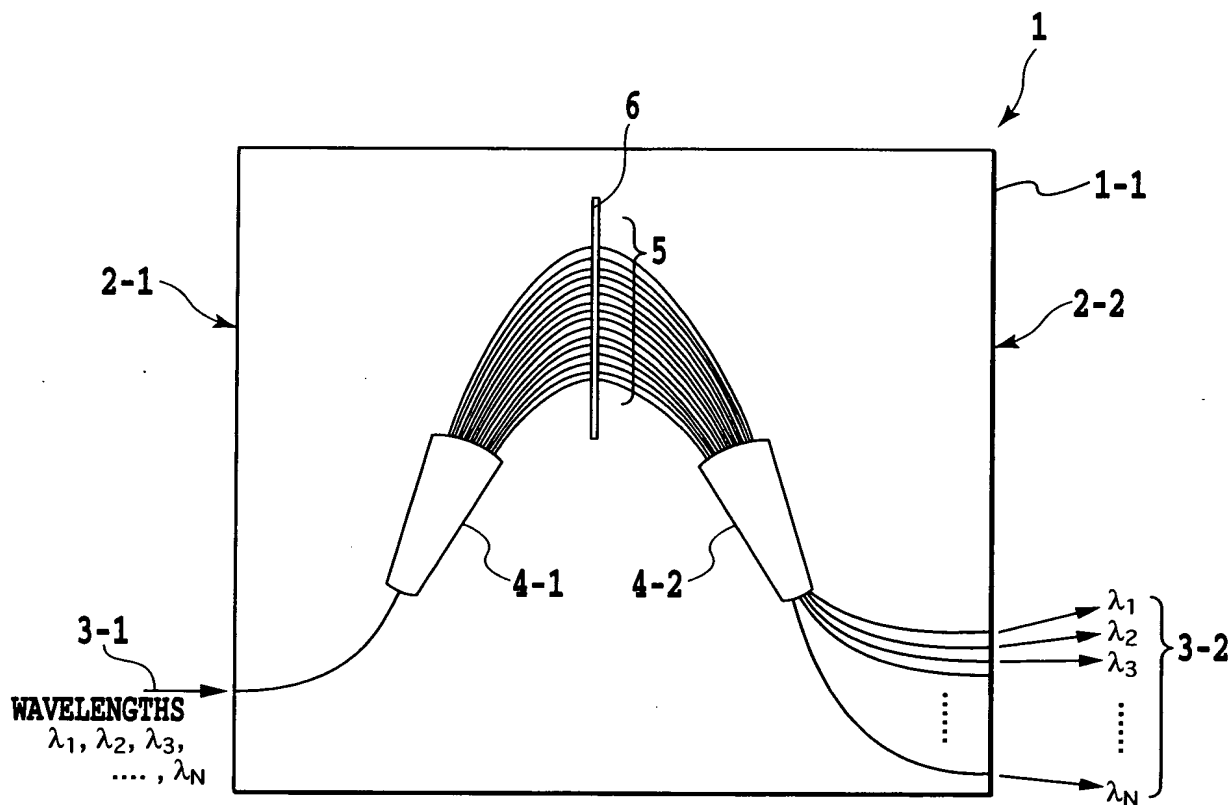


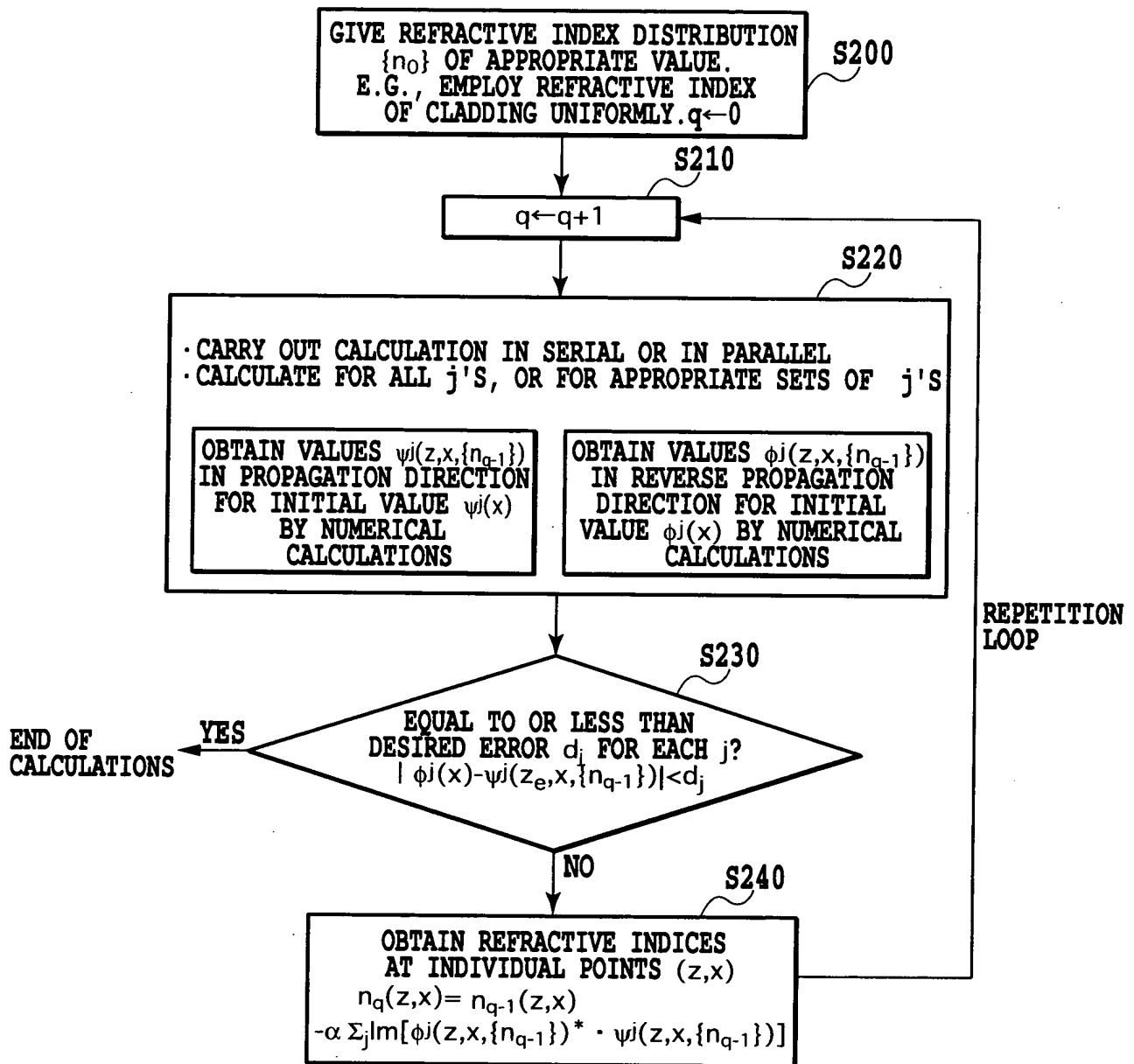
FIG. 5B

FIG. 5C



RELATED ART
FIG. 6

7/70



MEANING OF " \leftarrow " : FOR EXAMPLE,
 $A \leftarrow B + C$
 MEANS THAT SUM OF B AND C
 IS SUBSTITUTED FOR A.

FIG.7

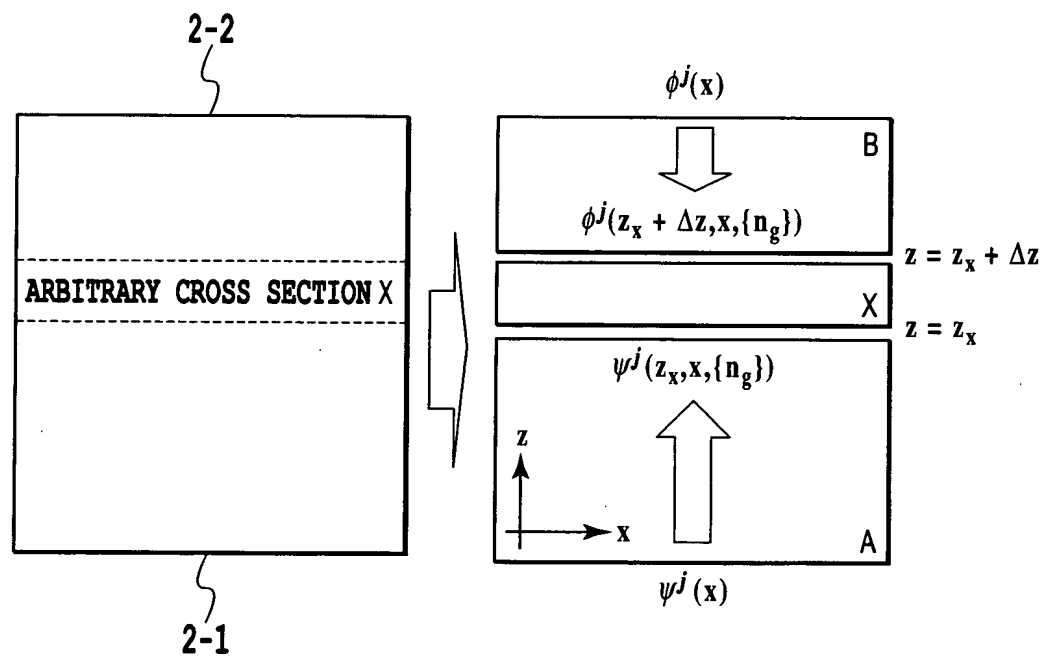


FIG.8

9/70

FIG.9A

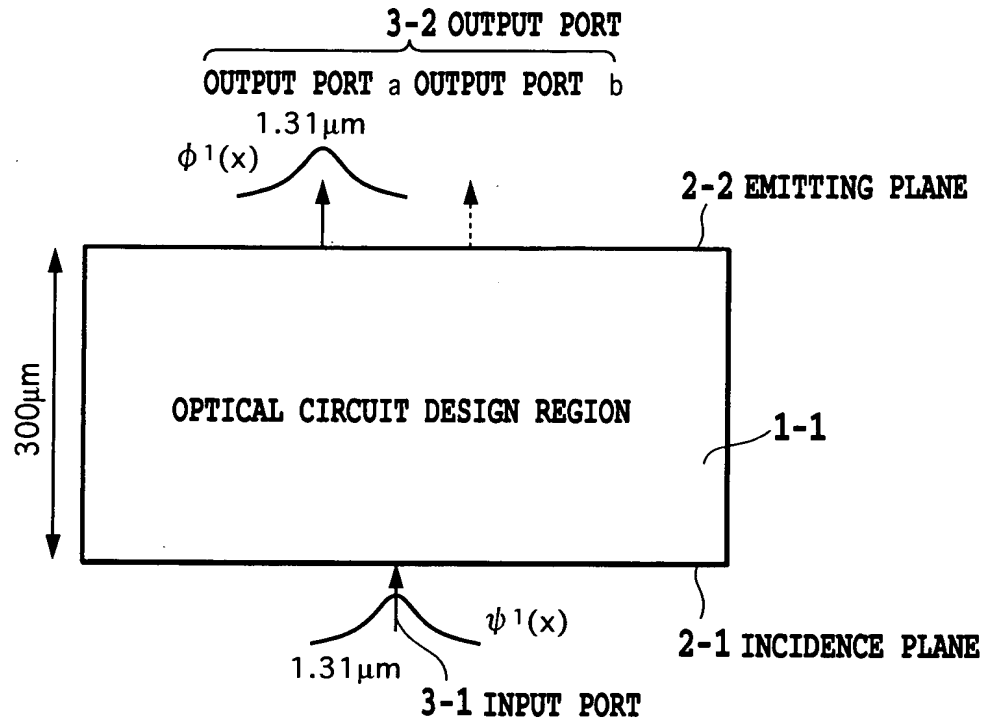
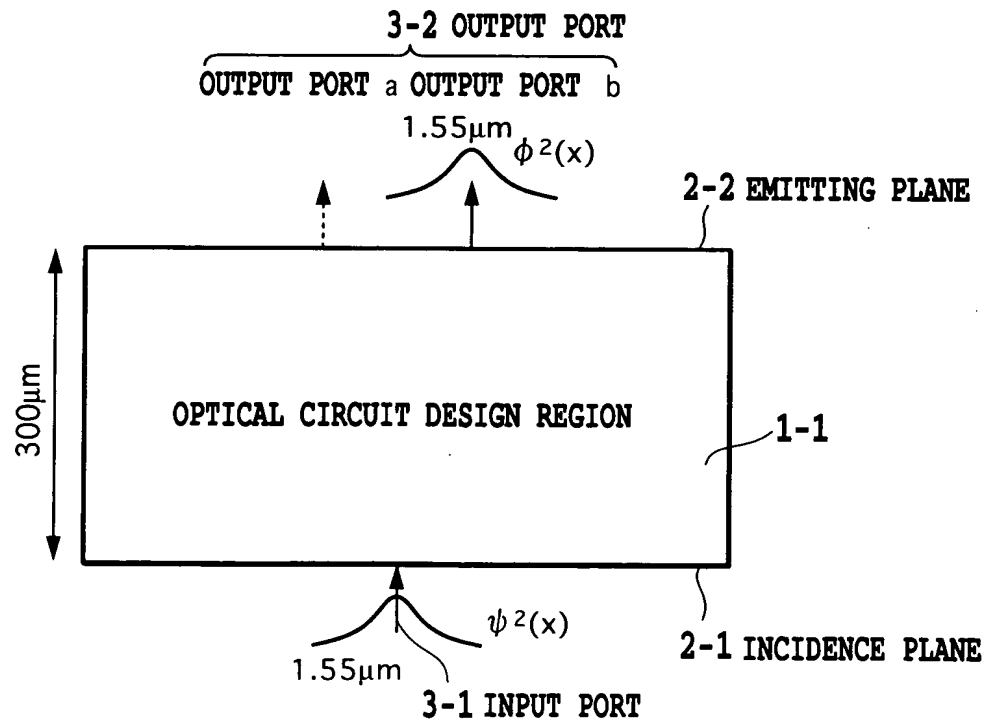


FIG.9B



10/70

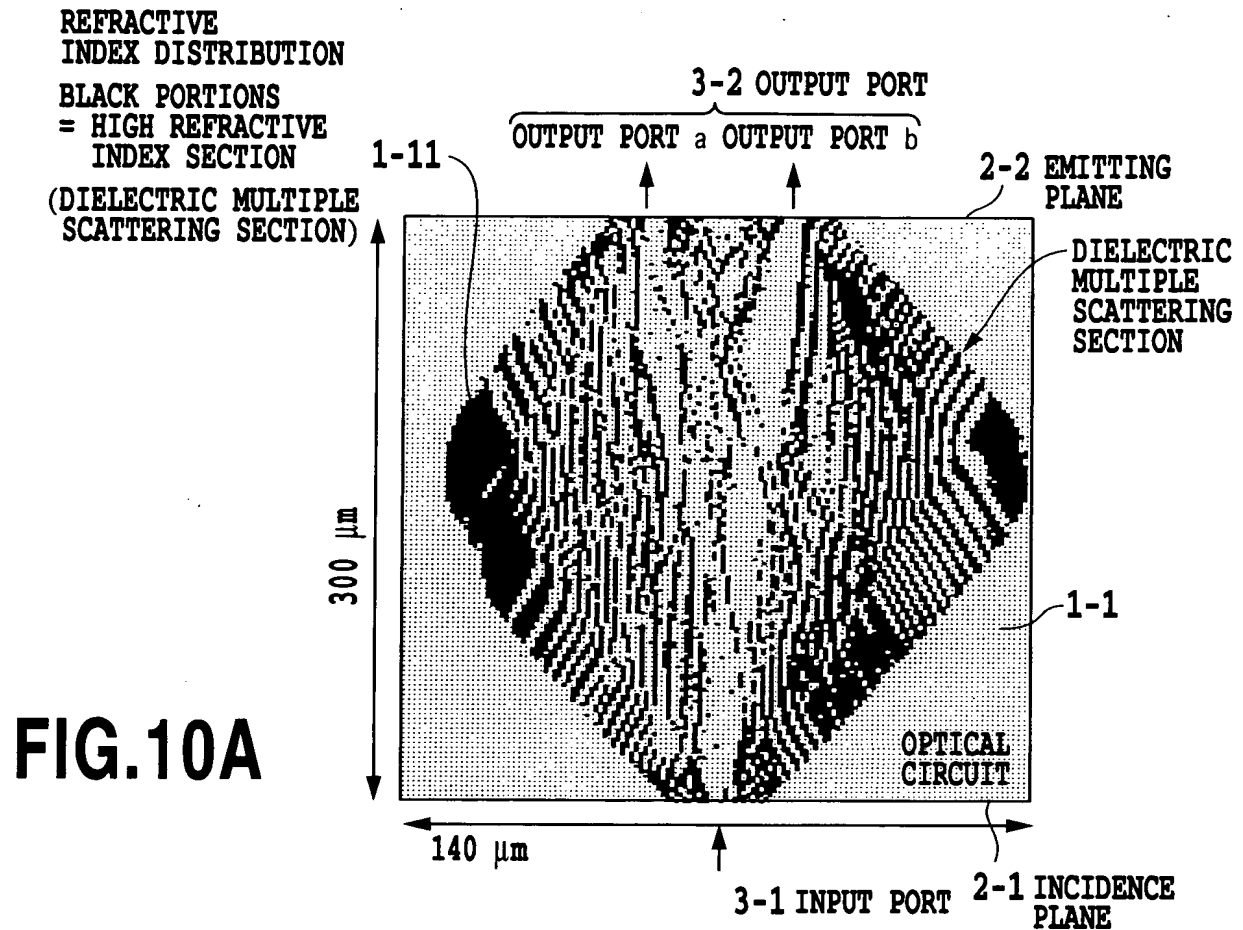


FIG. 10A

TRANSMISSION SPECTRUM

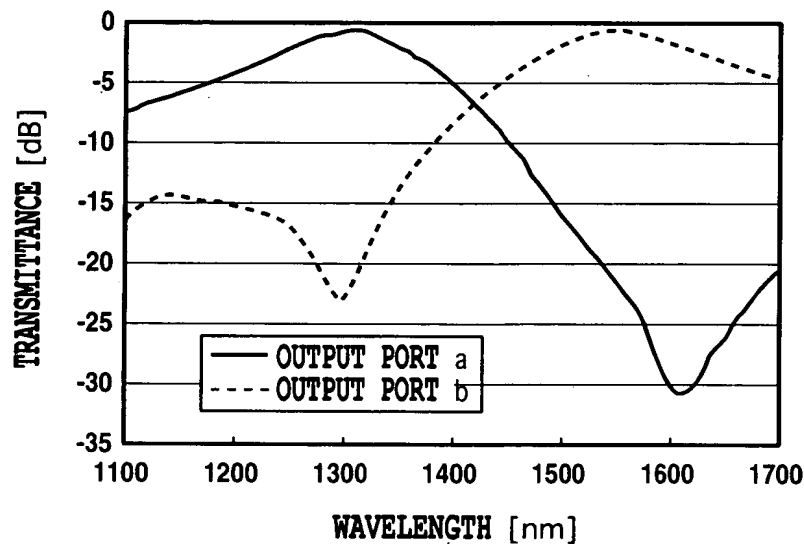
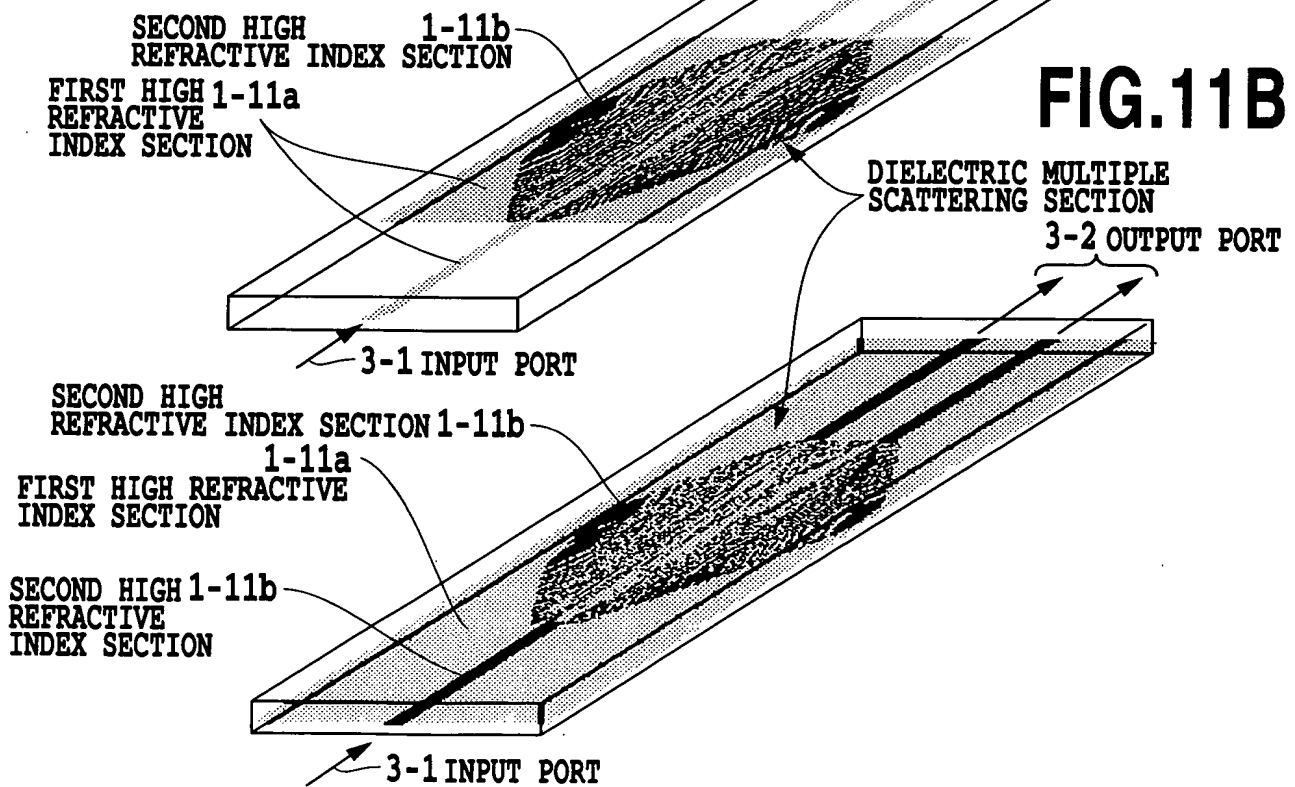
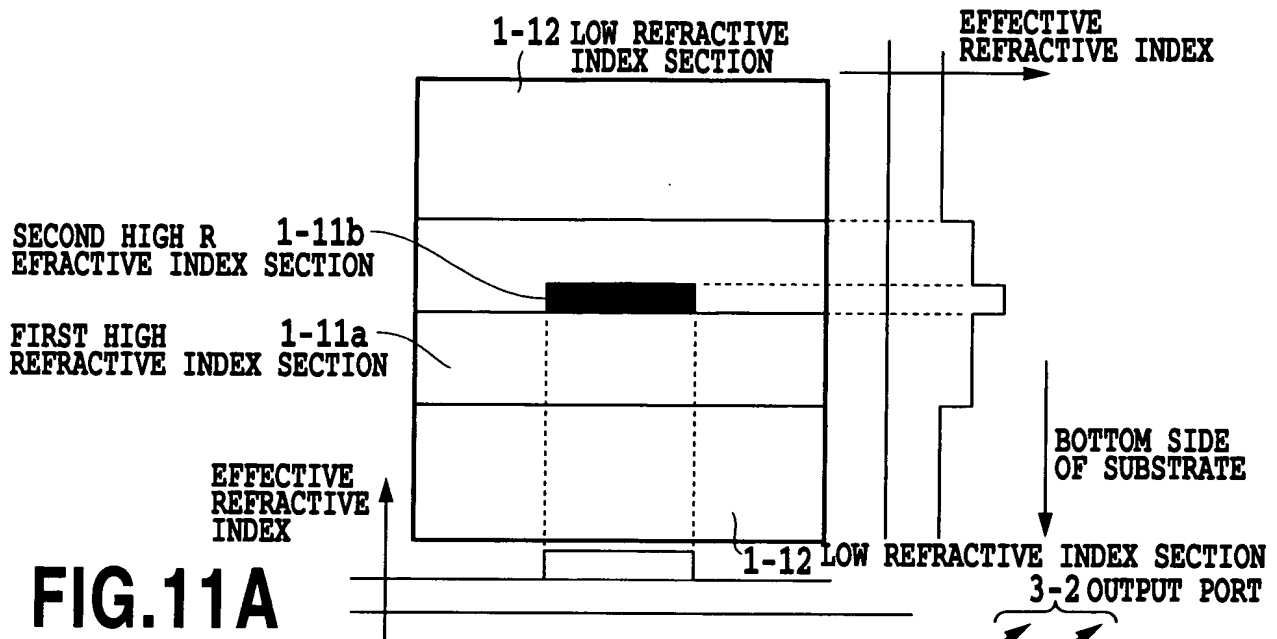


FIG. 10B

11/70



12/70

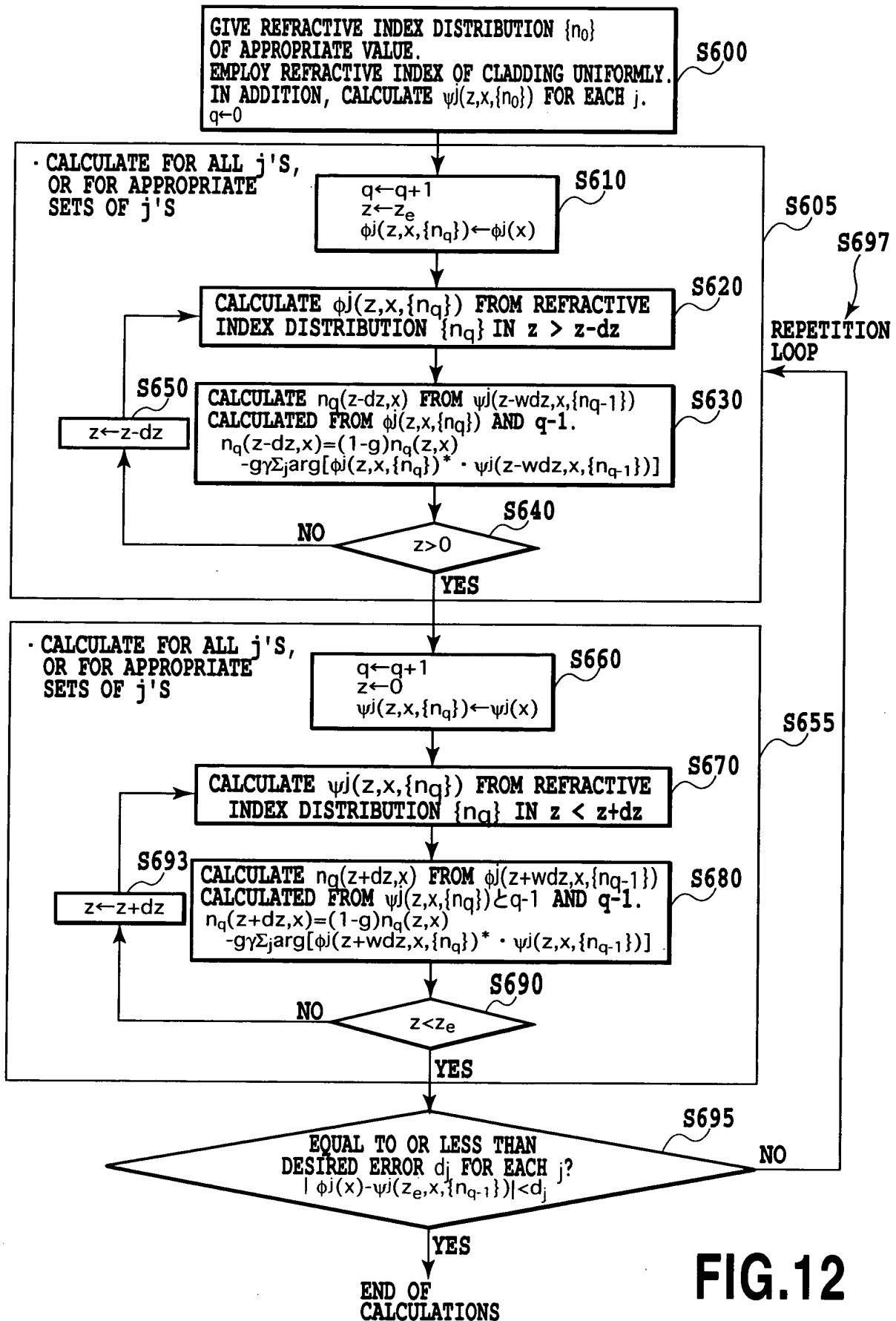


FIG.12

13/70

FIELD $\phi^j(z_x + \Delta z, x, \{n_{q-1}\})$ PRODUCED BY TRANSMITTING
FIRST PREVIOUS REFRACTIVE INDEX DISTRIBUTION $\{n_{q-1}\}$
ON CROSS SECTION IN REVERSE DIRECTION

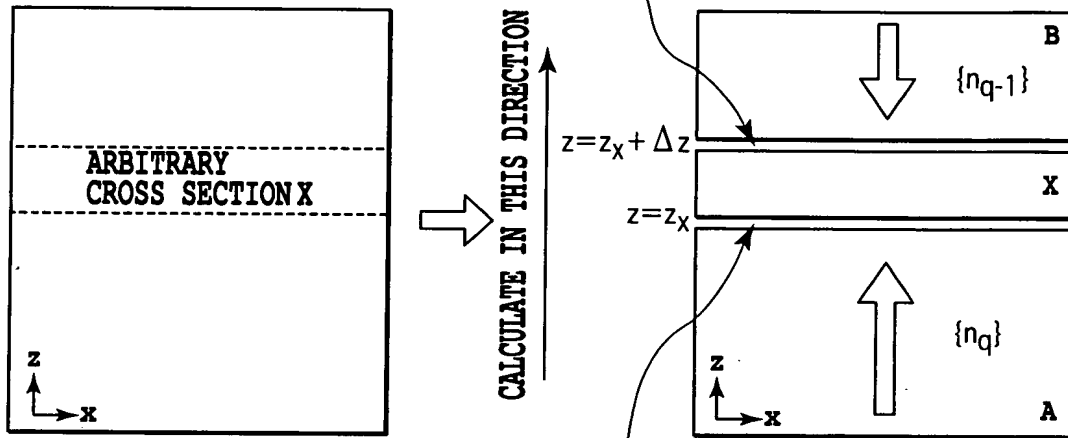


FIG. 13A

FIELD $\psi^j(z_x, x, \{n_q\})$ PRODUCED BY TRANSMITTING
PRESENT REFRACTIVE INDEX DISTRIBUTION $\{n_q\}$
ON CROSS SECTION IN FORWARD DIRECTION

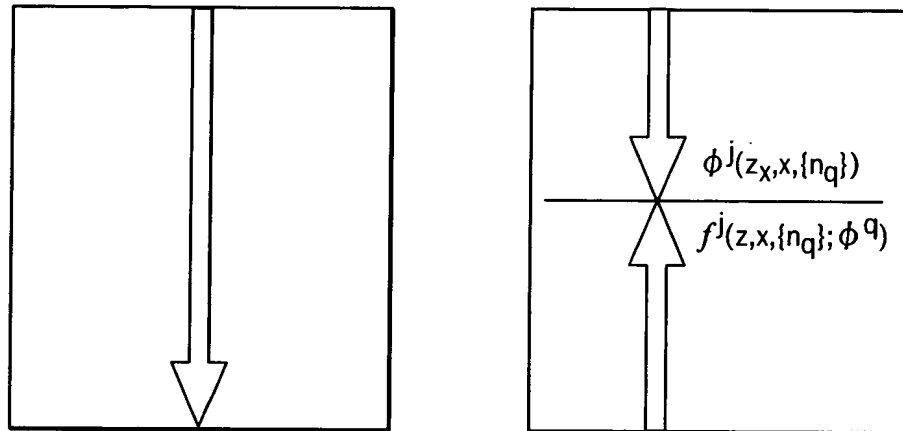


FIG. 13B

OUTPUT FIELD $\phi^j(z=0, x, \{n_q\})$
REVERSELY TRANSMITTED TO
 $z=0$ (ABBREVIATED TO ϕ^j_q)

$$f^j(z=0, x, \{n_q\}; \phi^j_q) = \phi^j(z=0, x, \{n_q\})$$

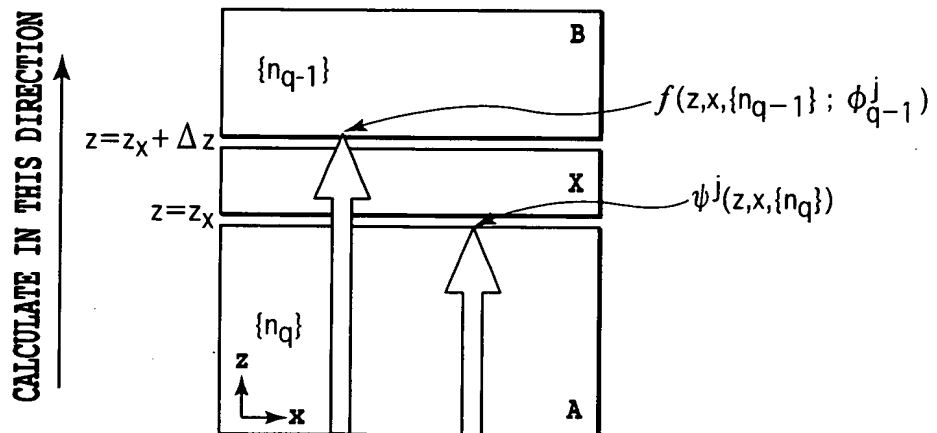


FIG. 13C

14/70

EMBODIMENT 1

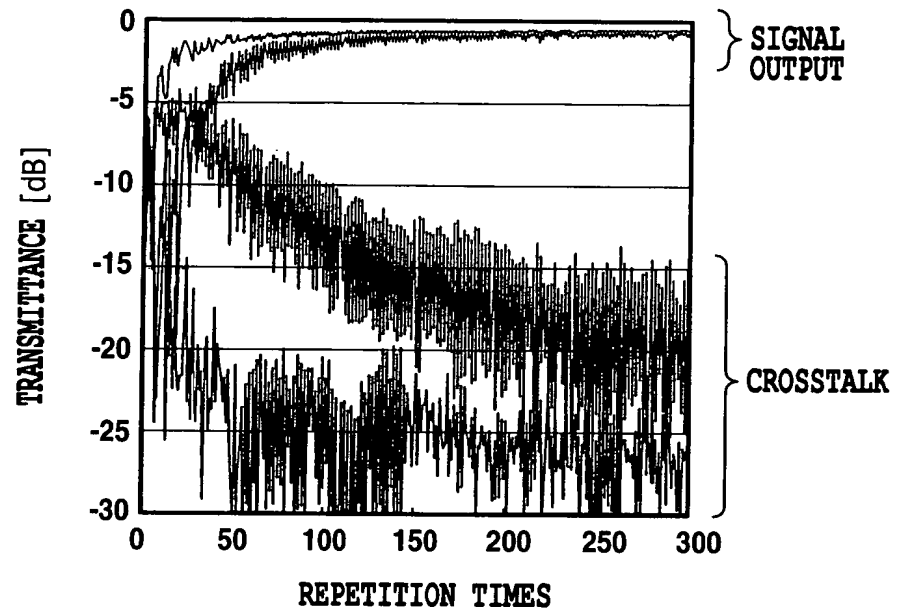


FIG.14A

EMBODIMENT 2

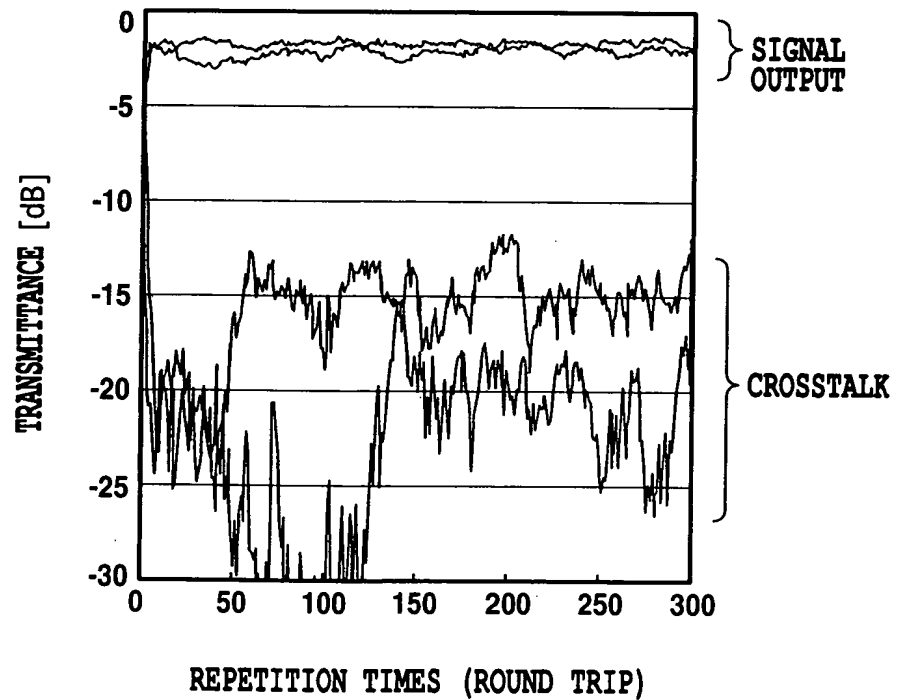


FIG.14B

15/70

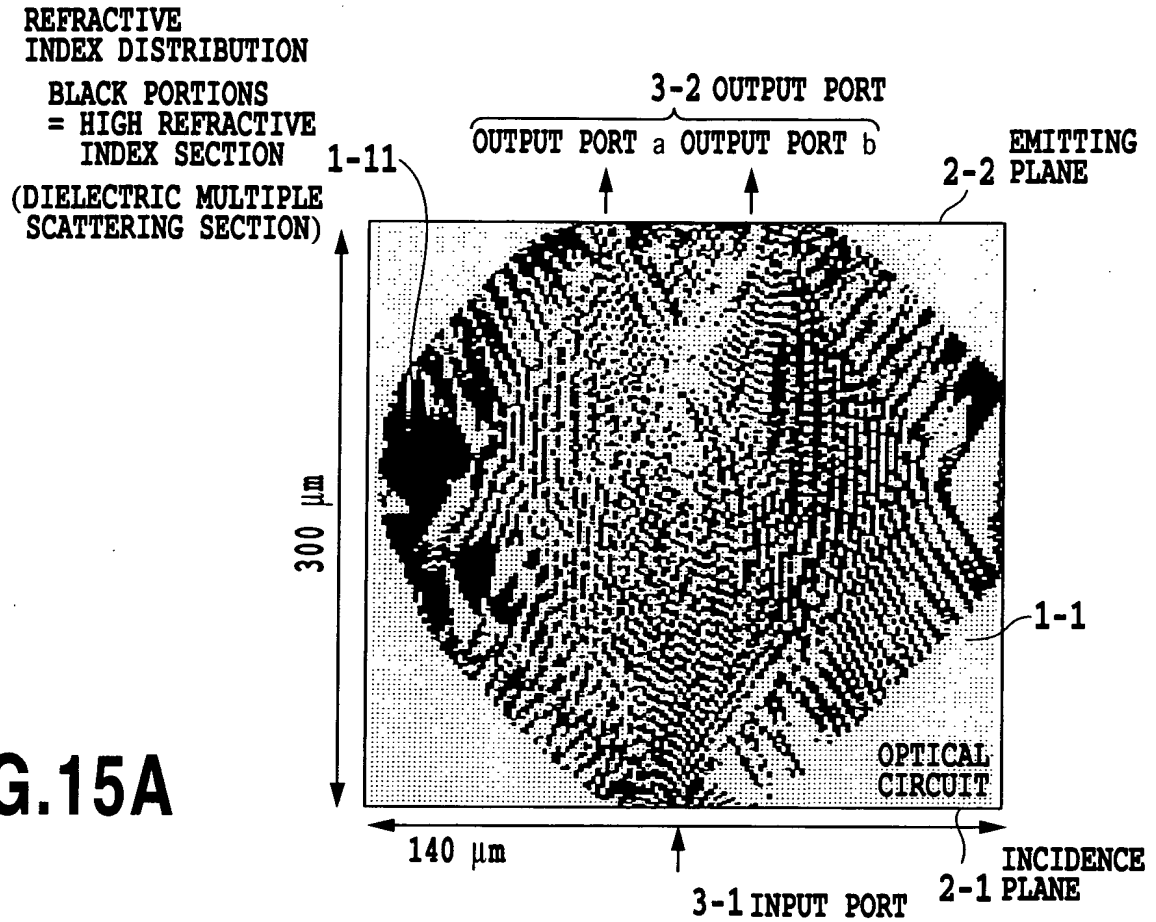


FIG. 15A

TRANSMISSION SPECTRUM

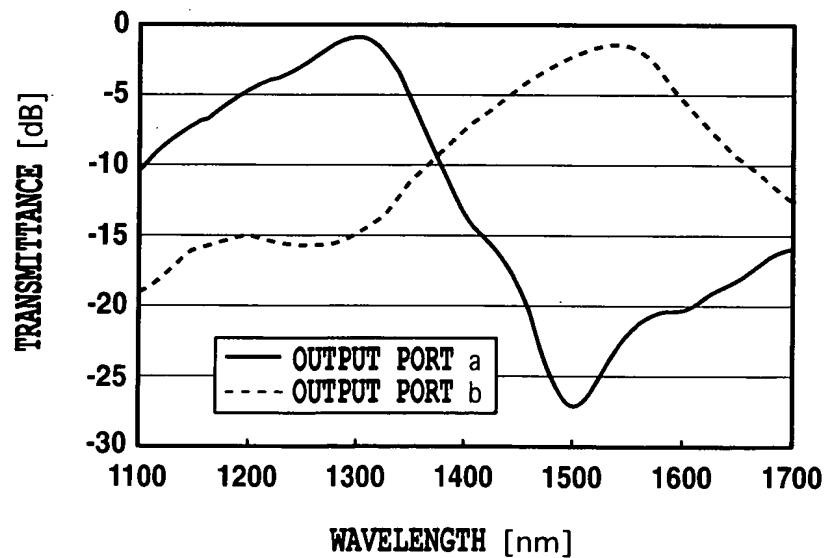


FIG. 15B

16/70

SET ONLY TE MODE

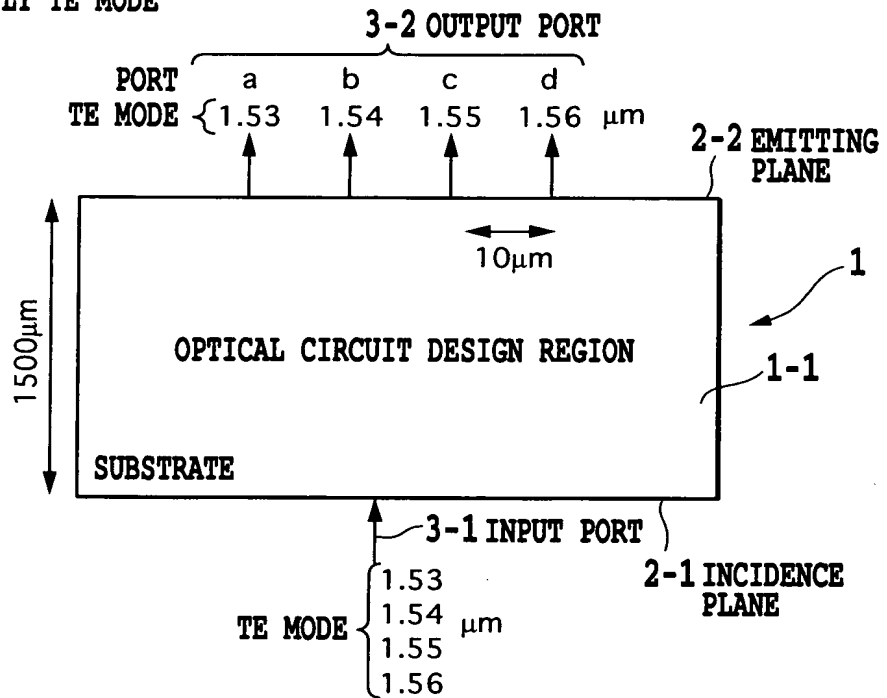


FIG. 16A

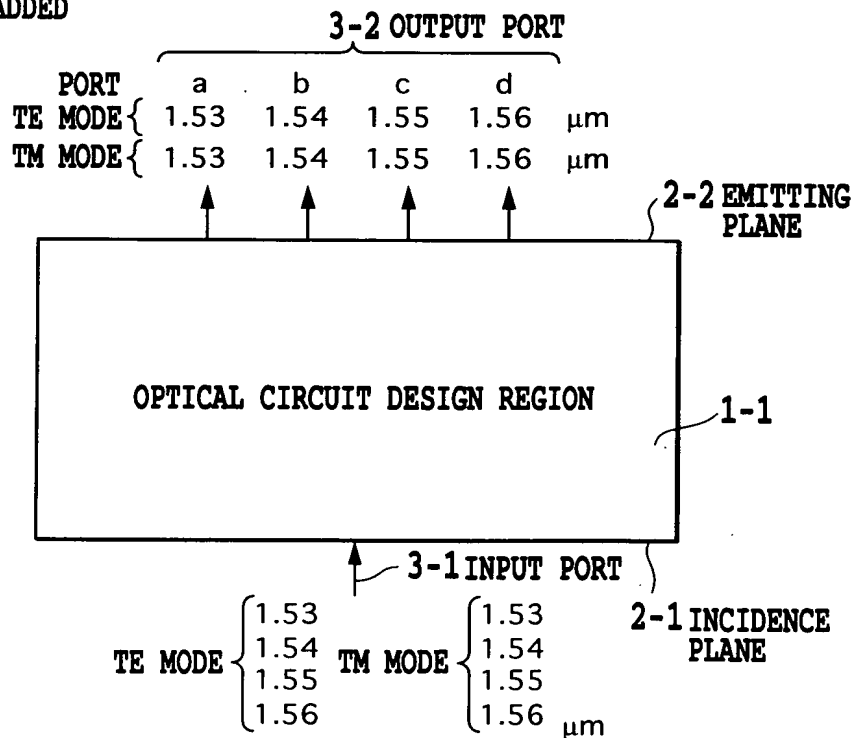
SETTING WITH
TM MODE ADDED

FIG. 16B

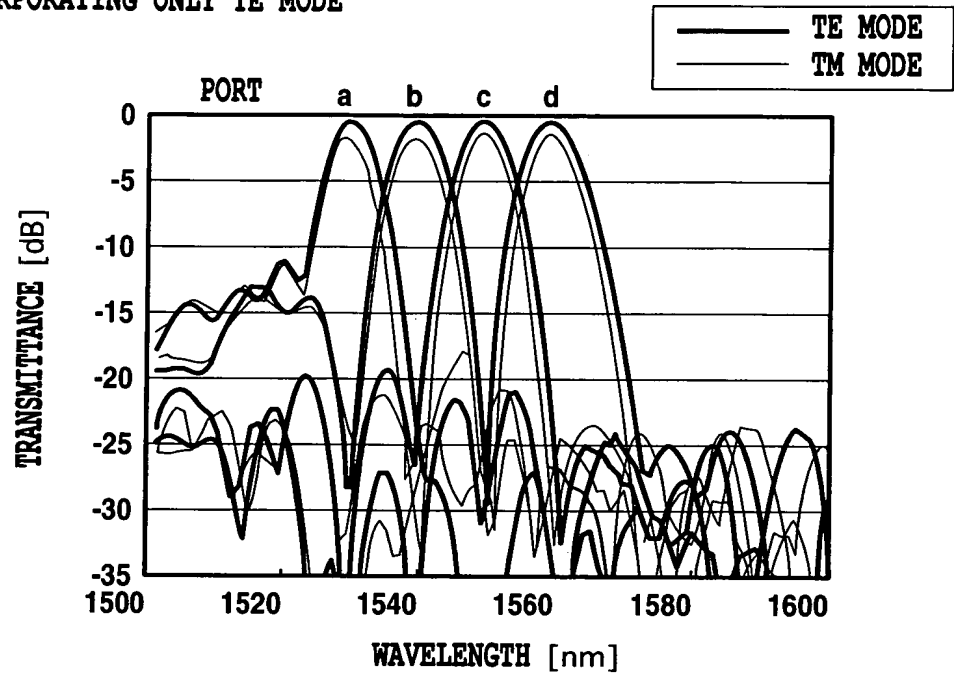
OPTICAL CIRCUIT DESIGNED
INCORPORATING ONLY TE MODE

FIG.17A

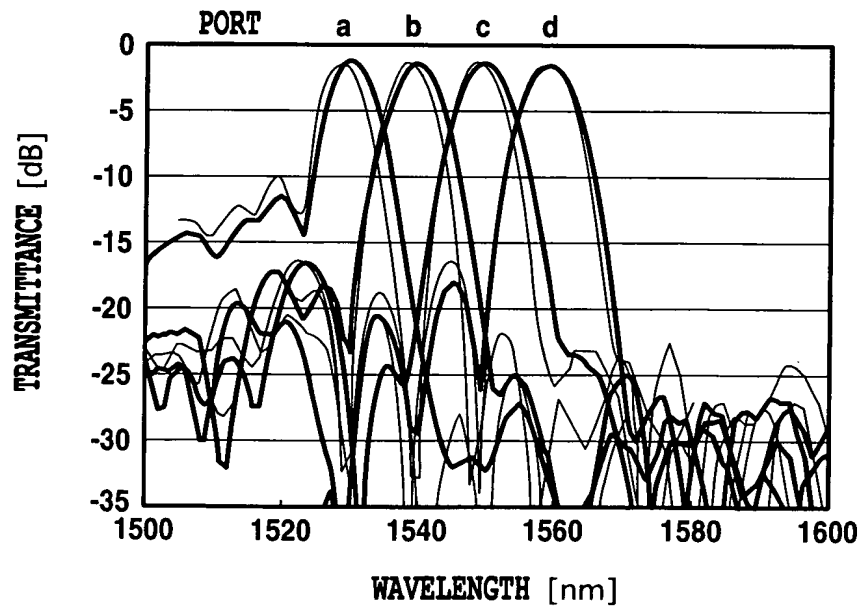
OPTICAL CIRCUIT DESIGNED
INCORPORATING TE MODE AND TM MODE

FIG.17B

18/70

SETUP OF SIMPLE
BANDPASS FILTER

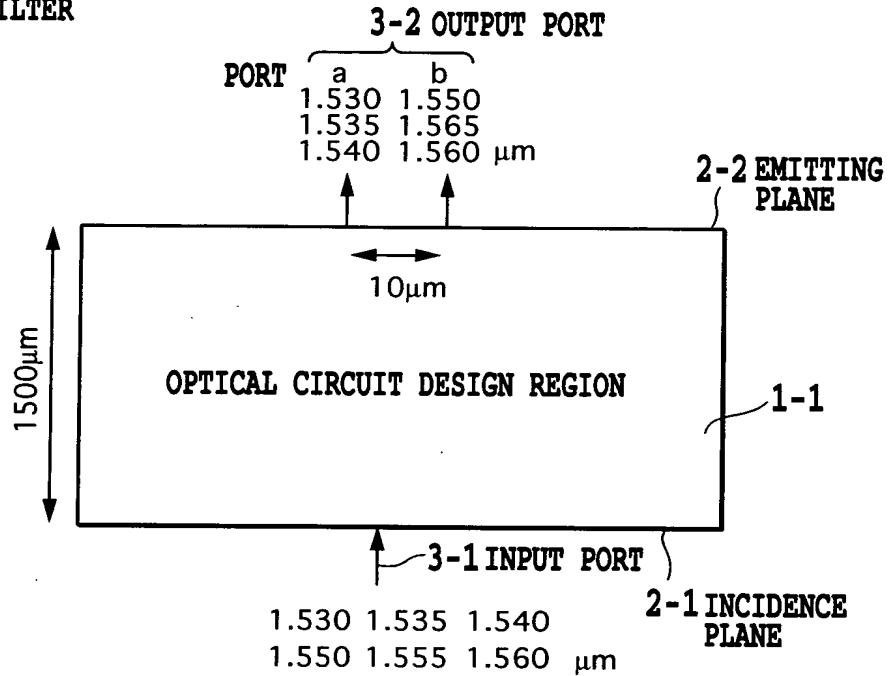


FIG.18A

SETUP INCLUDING DUMMY
PORT C FOR BAND SHAPING

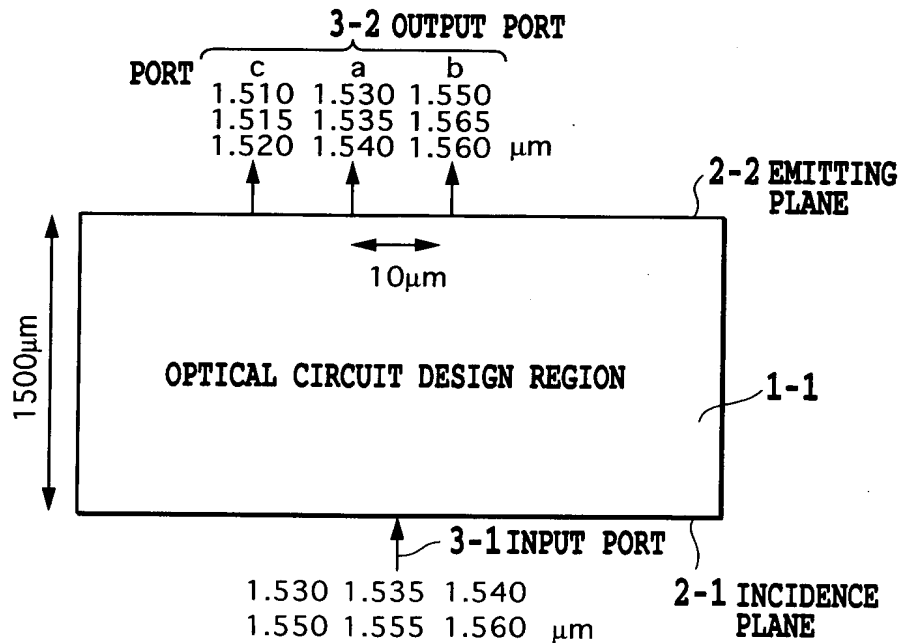


FIG.18B

19/70

SPECTRA IN SETUP OF SIMPLE BANDPASS FILTER

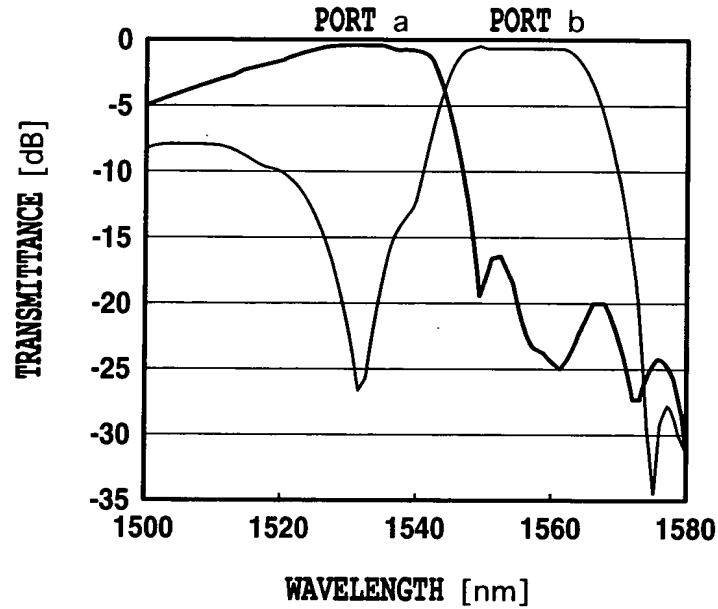


FIG.19A

SPECTRA IN SETUP INCLUDING DUMMY PORT C FOR BAND SHAPING

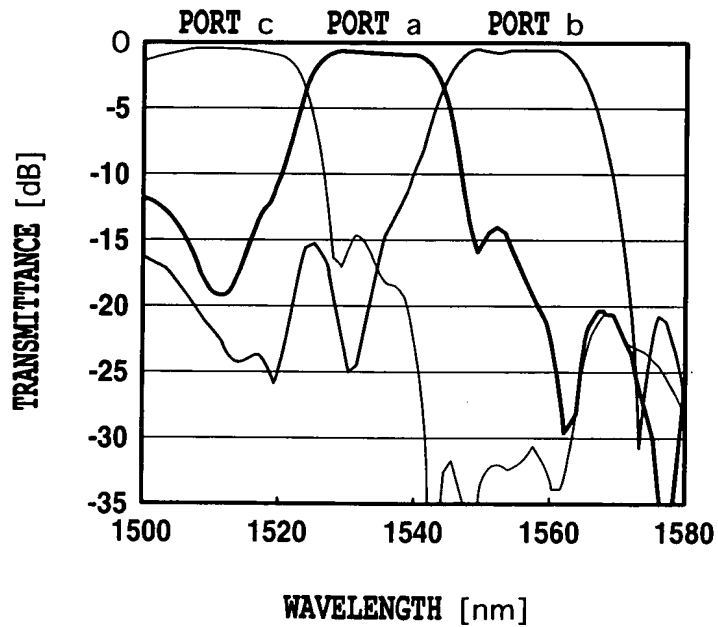


FIG.19B

20/70

SETUP OF OUTPUT PORT OF BANDPASS FILTER

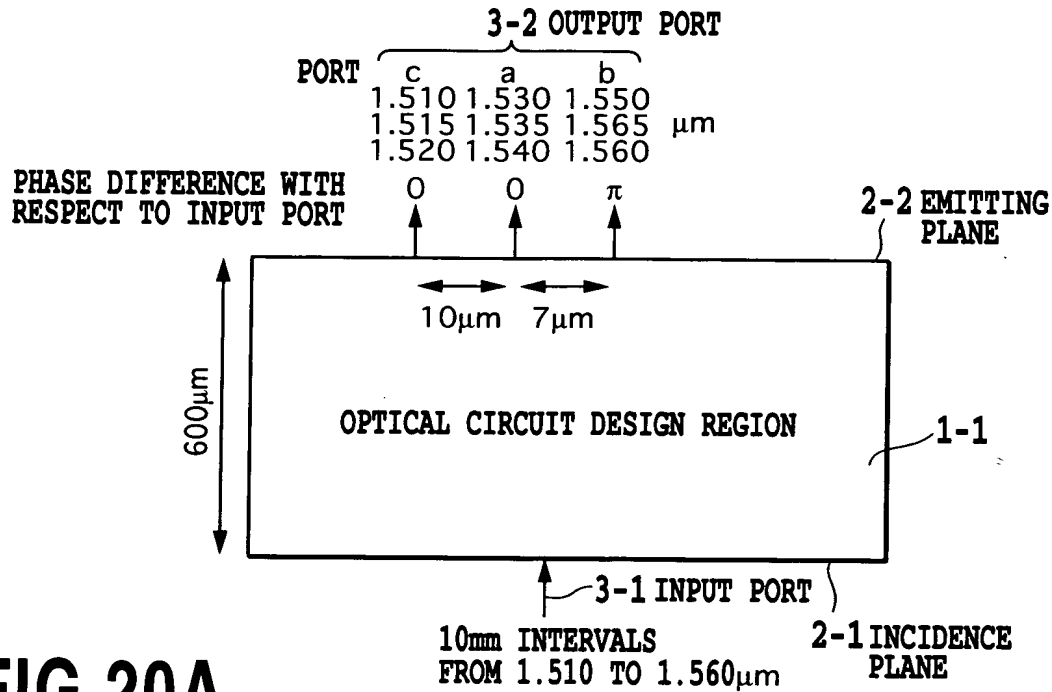


FIG.20A

TRANSMISSION SPECTRA

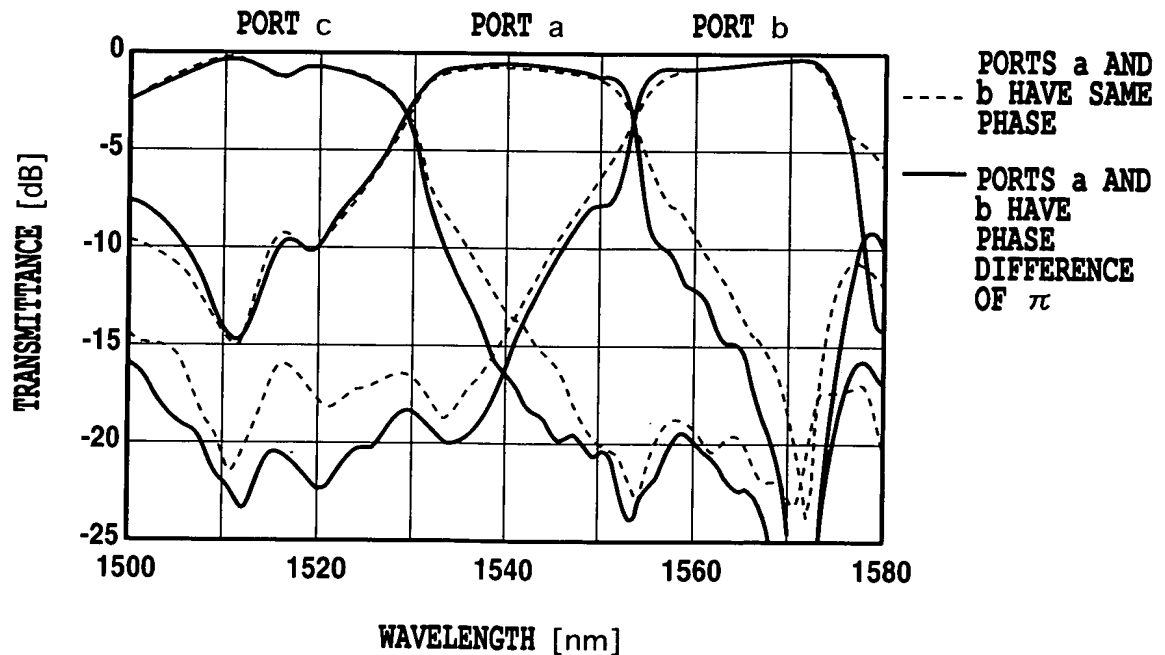


FIG.20B

21/70

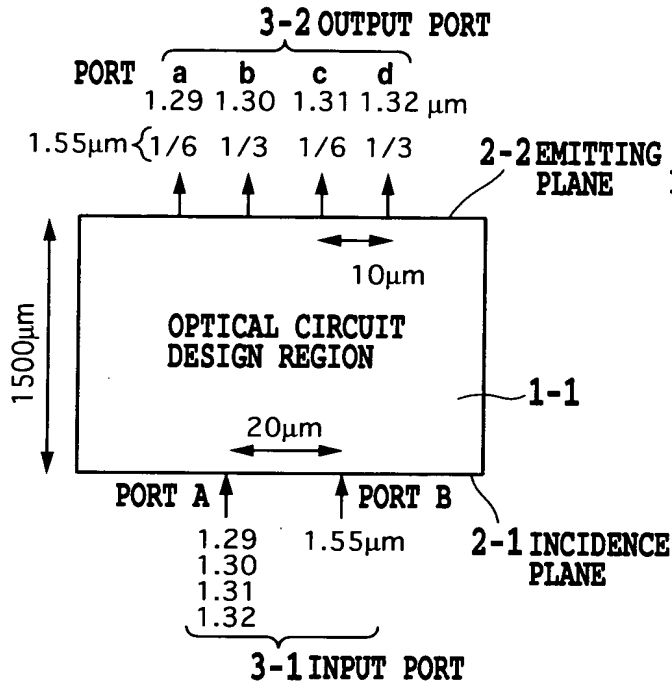
SETUP OF INPUT
AND OUTPUT PAIRS

FIG.21A

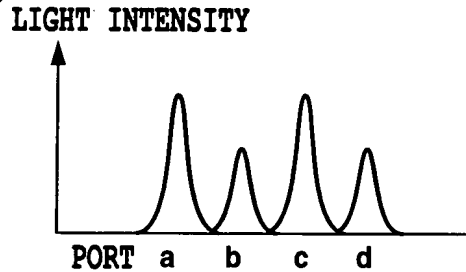
SETUP OF EMITTED FIELD
DISTRIBUTION OF $1.55\mu\text{m}$ 

FIG.21B

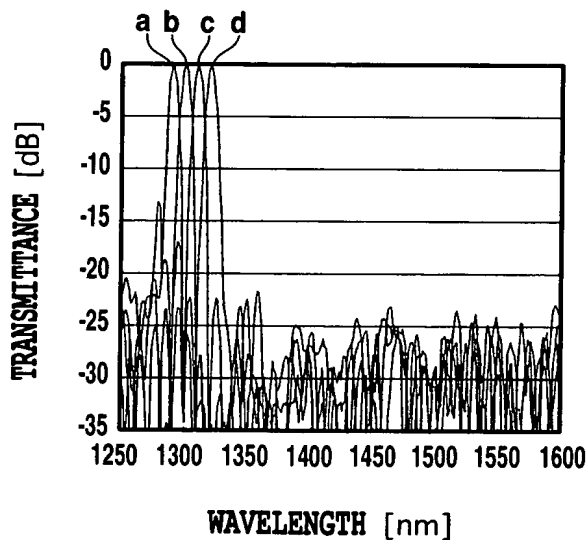
TRANSMISSION SPECTRA
WHEN LAUNCHED INTO PORT a

FIG.21C

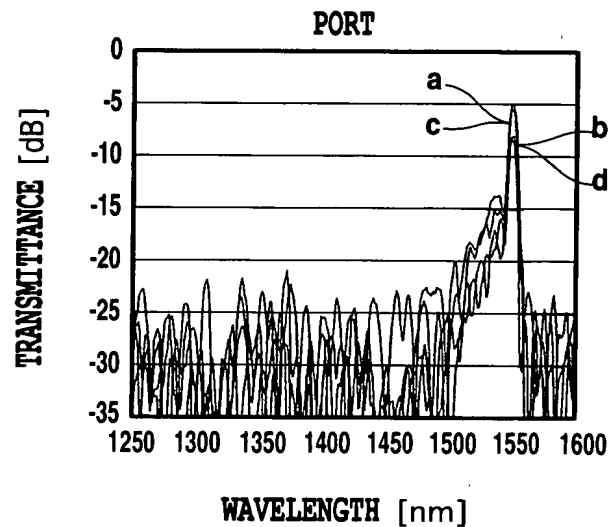
TRANSMISSION SPECTRA
WHEN LAUNCHED INTO PORT b

FIG.21D

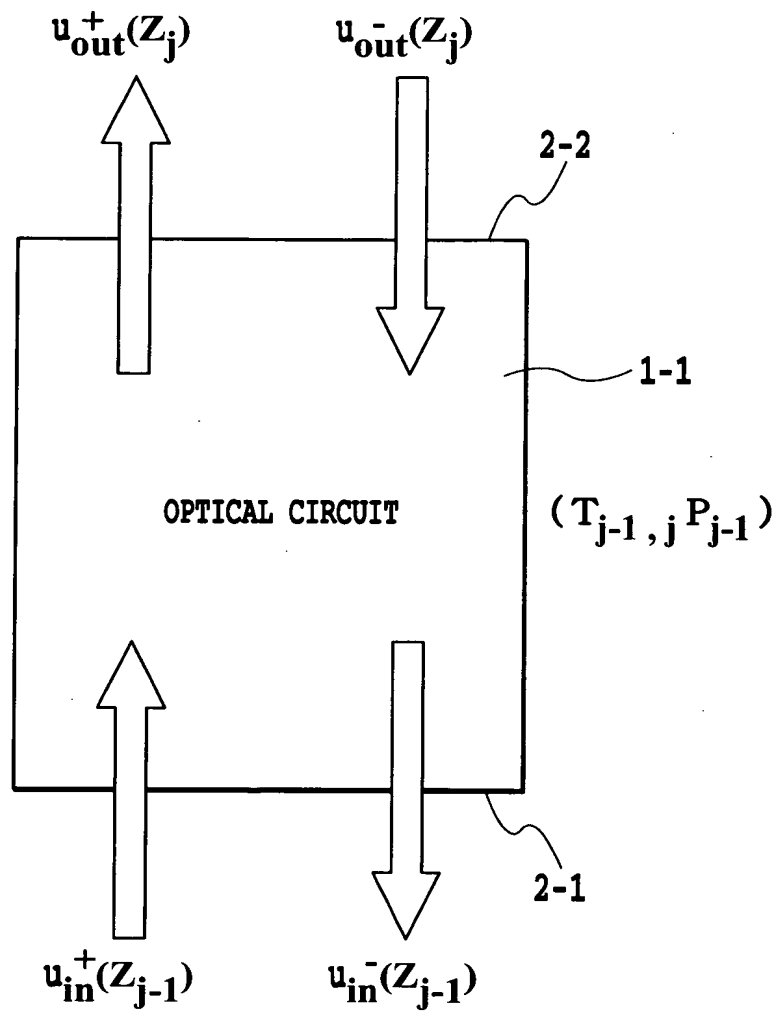


FIG.22

23/70

FIG.23A

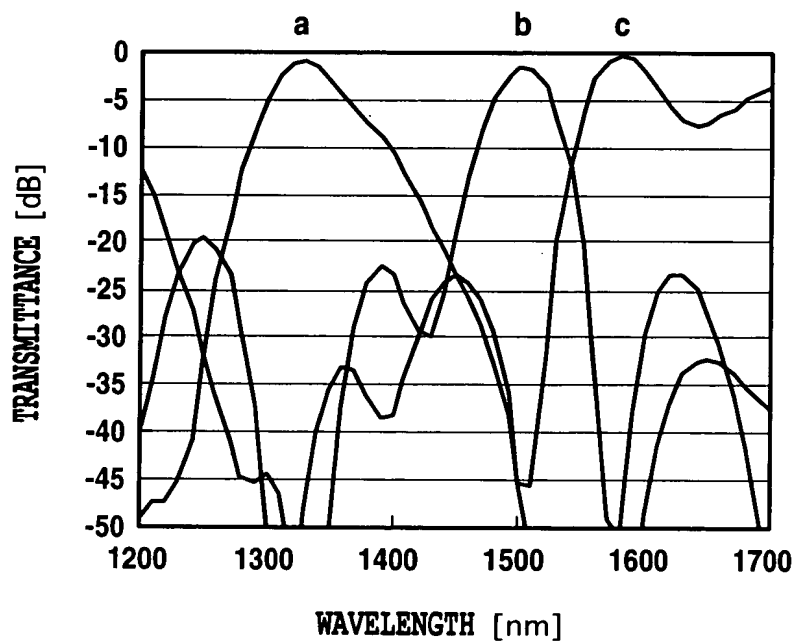
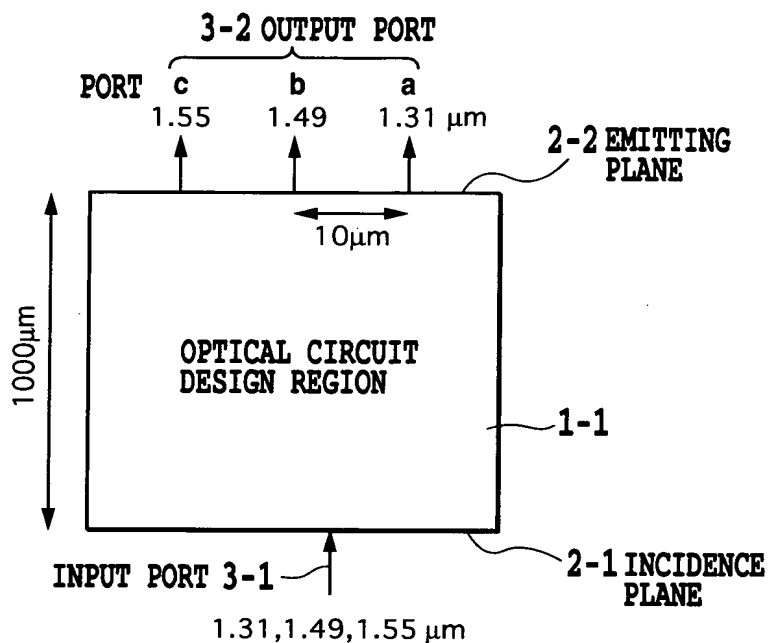
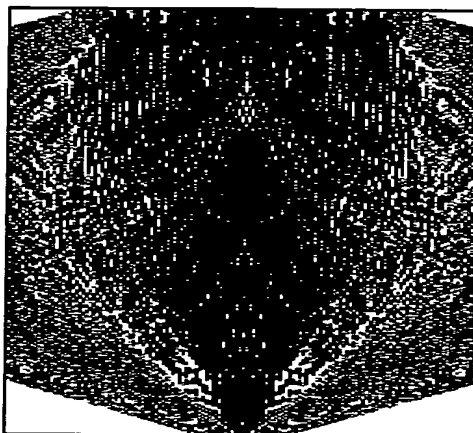


FIG.23B

24/70

BEHAVIOR OF REFRACTIVE
INDEX DISTRIBUTION



$420\mu\text{m} \times 1800\mu\text{m}$
 $\Delta = 0.75\%$
 PIXEL SIZE = $3\mu\text{m} \times 3\mu\text{m}$

FIG.24A

BEHAVIOR OF
OPTICAL TRANSMISSION

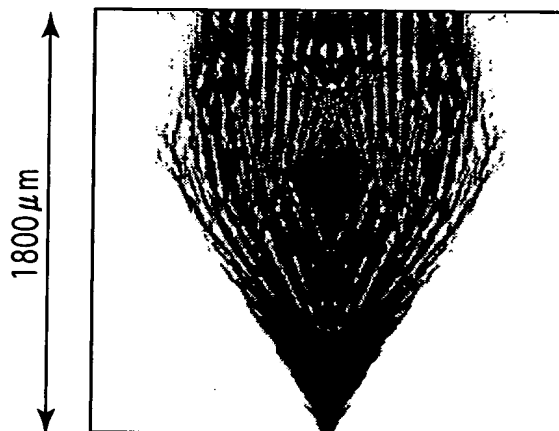


FIG.24B

TRANSMISSION LOSS
OF EACH PORT

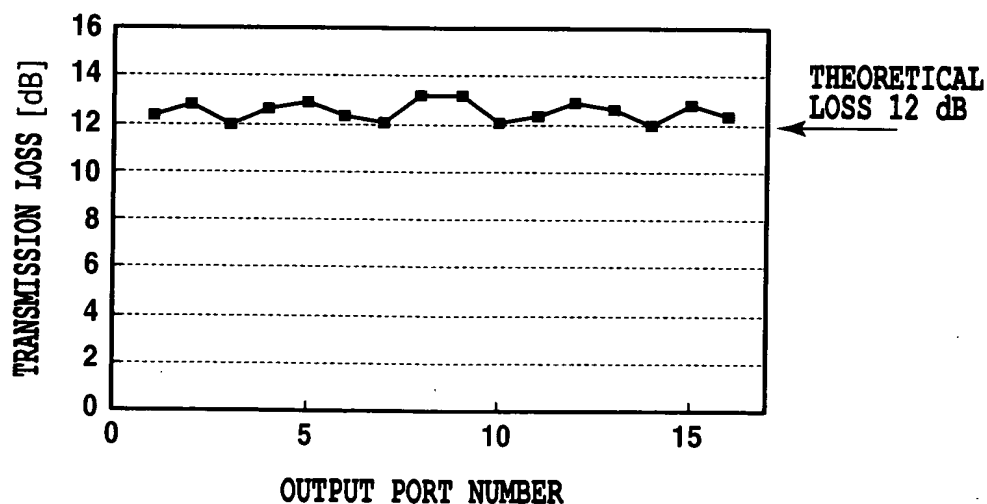


FIG.24C

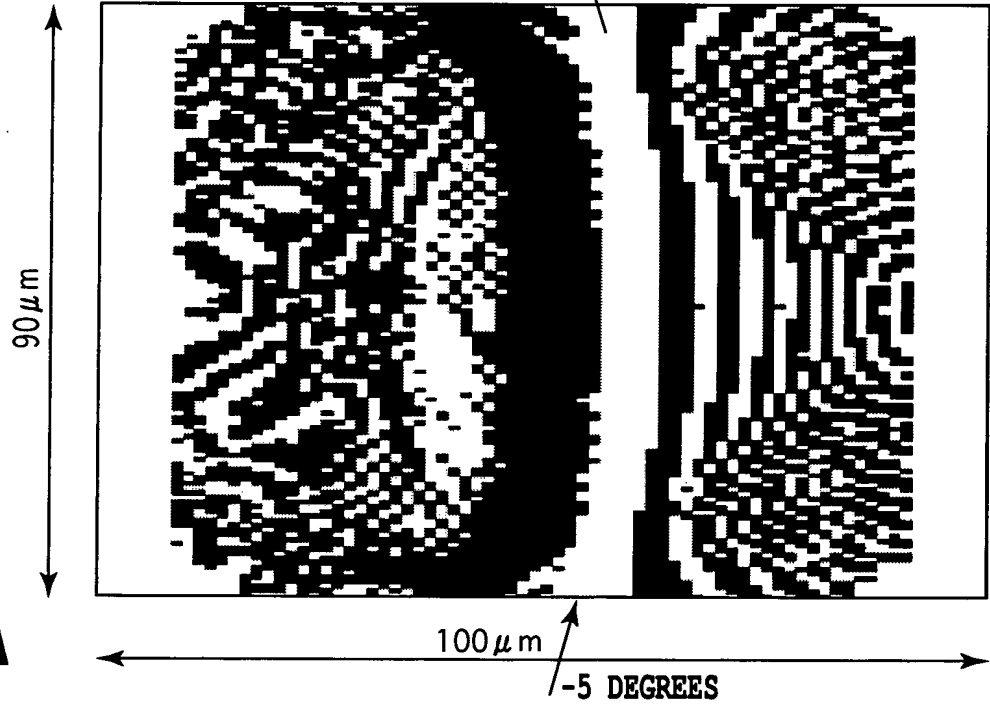
REFRACTIVE INDEX
DISTRIBUTION

FIG.25A

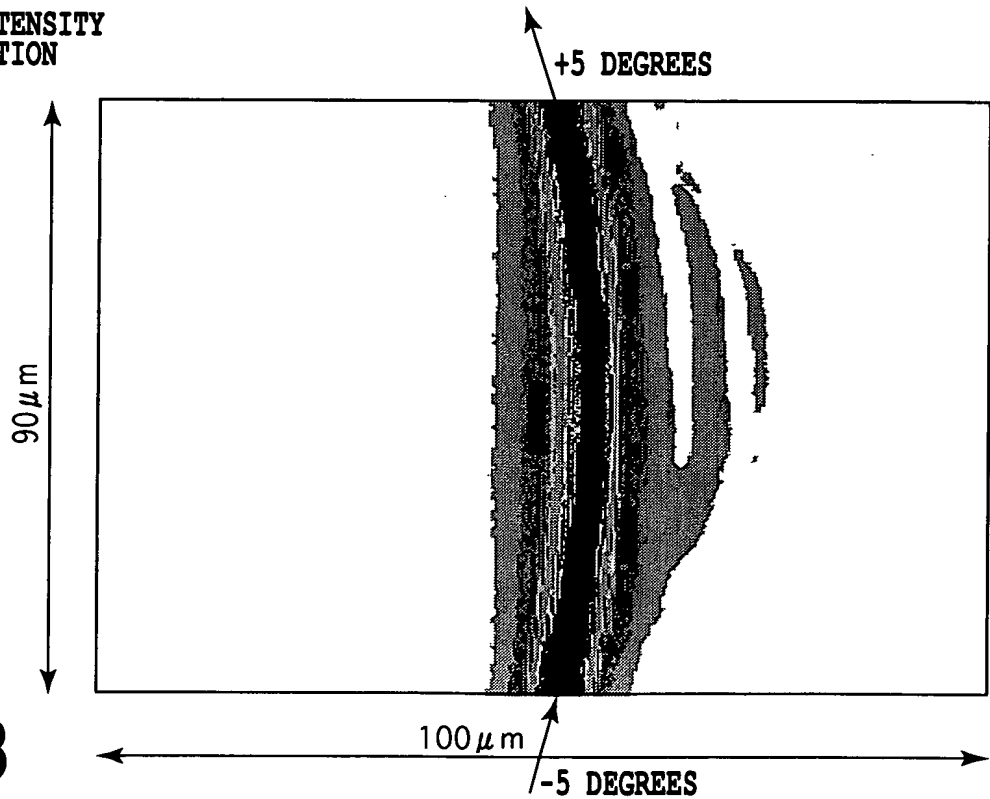
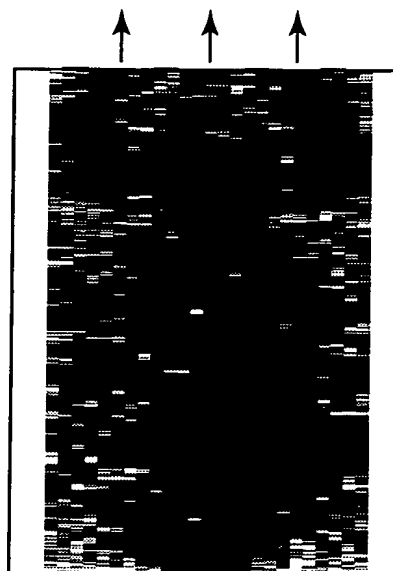
FIELD INTENSITY
DISTRIBUTION

FIG.25B

REFRACTIVE
INDEX DISTRIBUTION



1.31/1.49/1.55 μm
WDM SPLITTER

FIG.26A

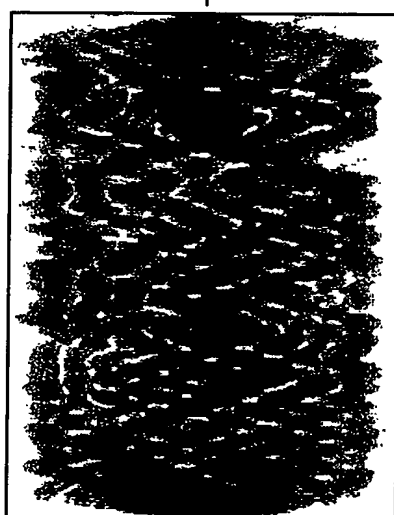
BEHAVIOR OF
FIELD PROPAGATION

1.31 μm



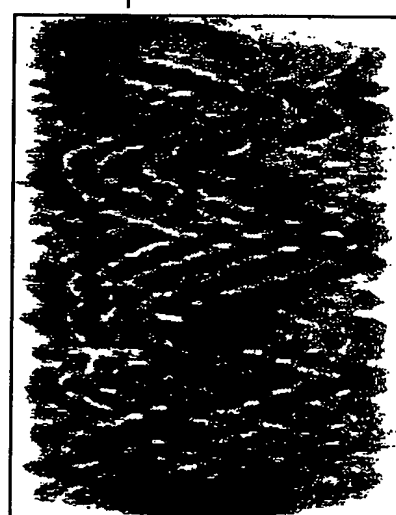
(b₁)

1.49 μm



(b₂)

1.55 μm



(b₃)

FIG.26B

27/70

BLACK PORTIONS
= HIGH REFRACTIVE INDEX SECTION

DESIGN METHOD
OF EMBODIMENT 11

ORDINARY
DESIGN METHOD

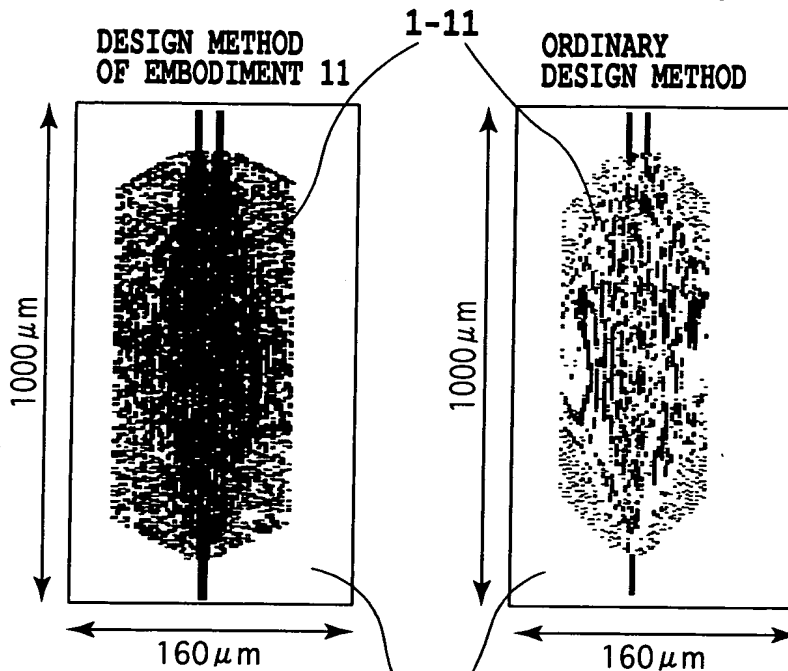


FIG.27A

1-1
OPTICAL CIRCUIT
DESIGN REGION

HOLLOW PORTIONS
= LOW REFRACTIVE
INDEX SECTION
1-12

SHADED PORTIONS
= HIGH REFRACTIVE
INDEX SECTION
1-11

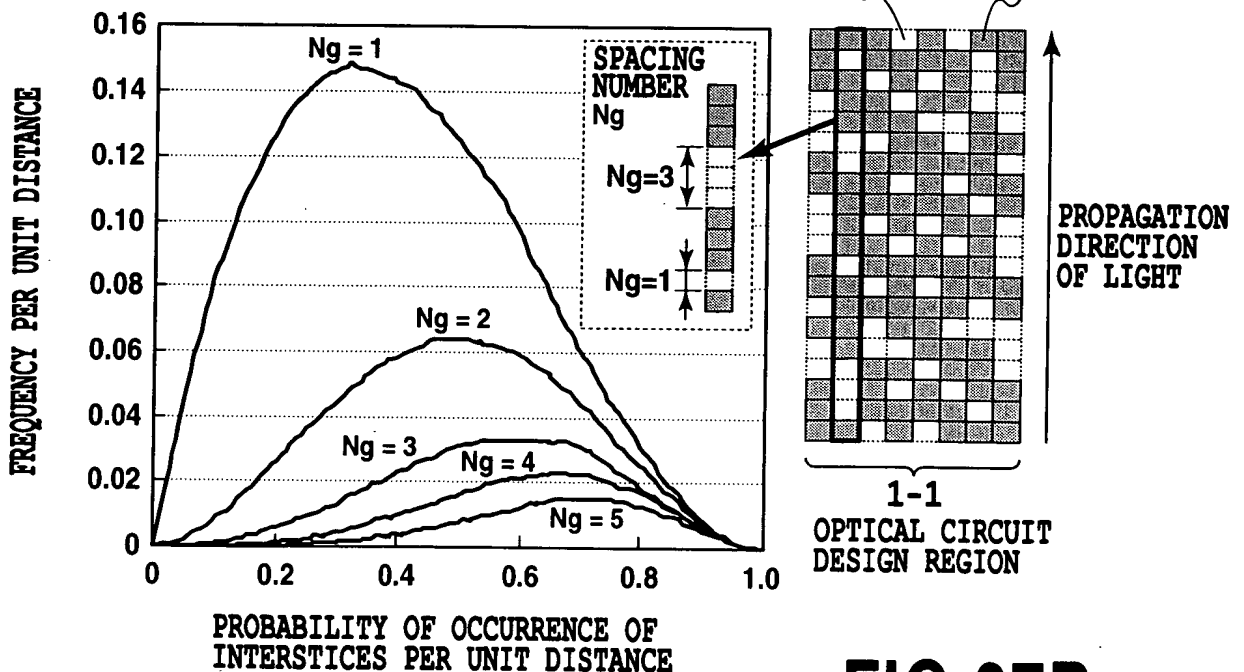


FIG.27B

Title: WAVE TRANSMISSION MEDIUM AND WAVEGUIDE CIRCUIT

Inventors: Toshikazu Hashimoto et al.

Docket No. 14321.78

28/70

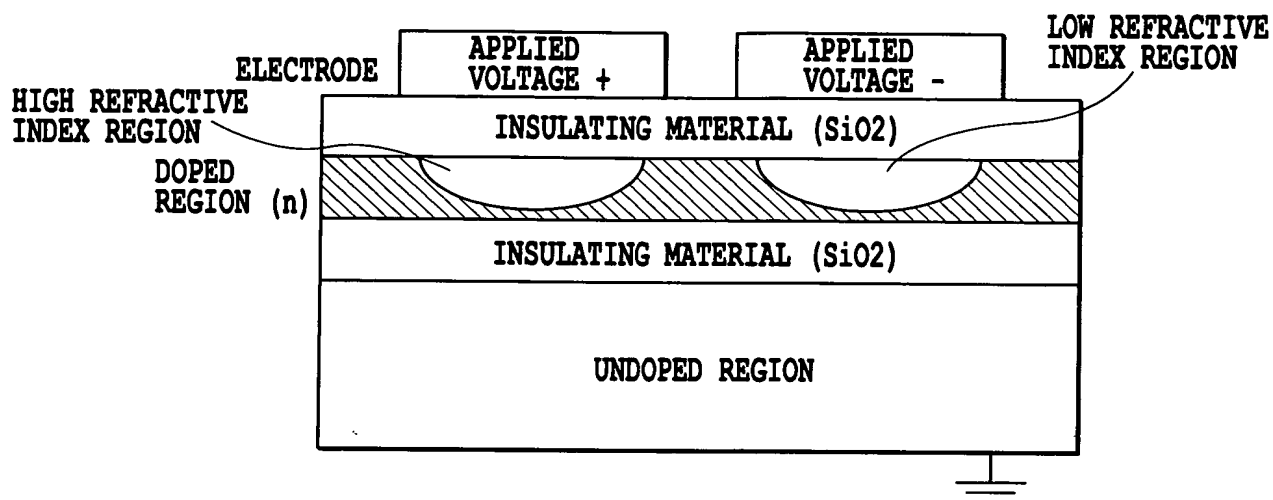


FIG.28A

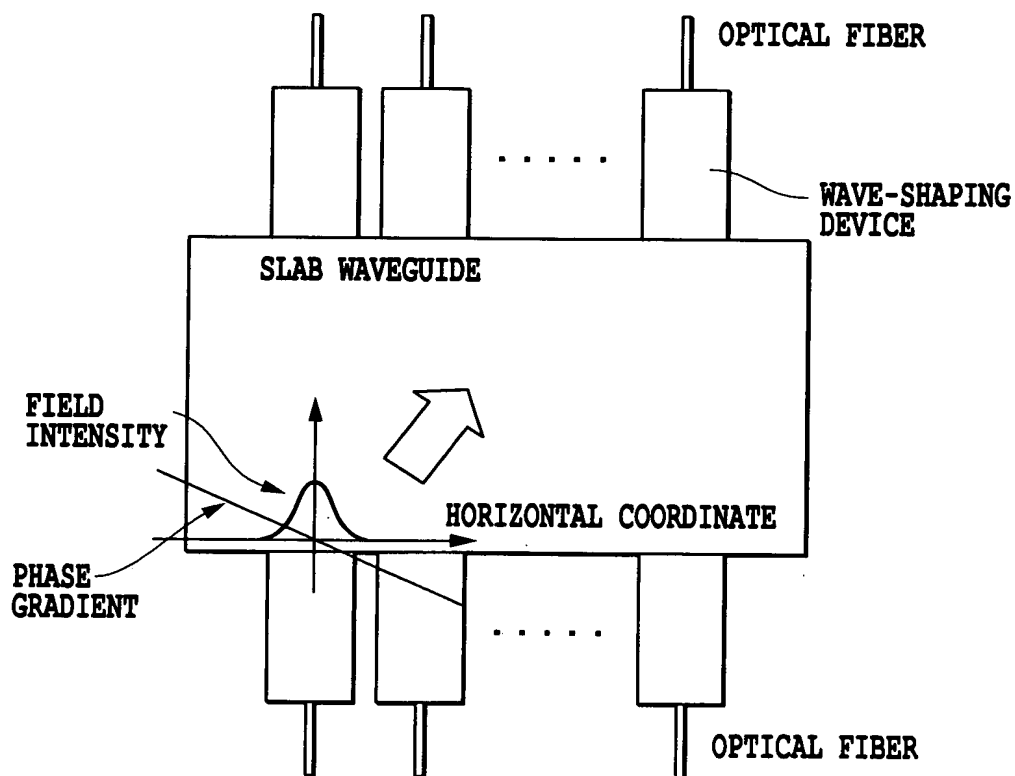


FIG.28B

29/70

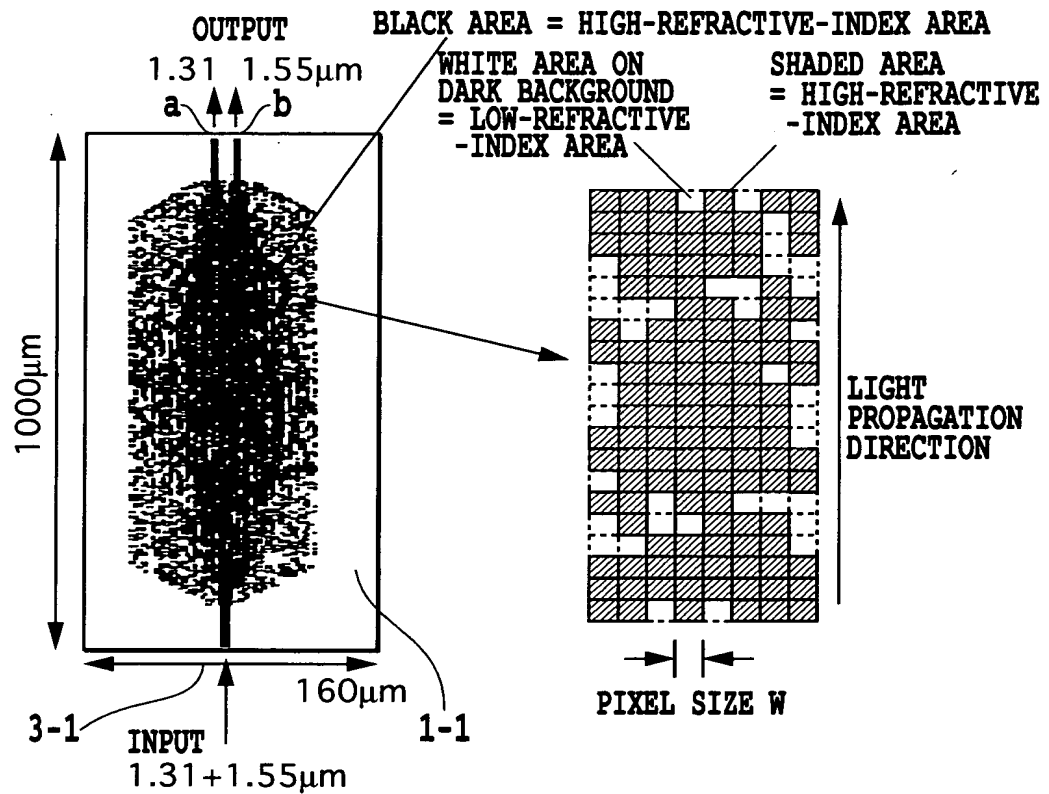


FIG.29A

FIG.29B

30/70

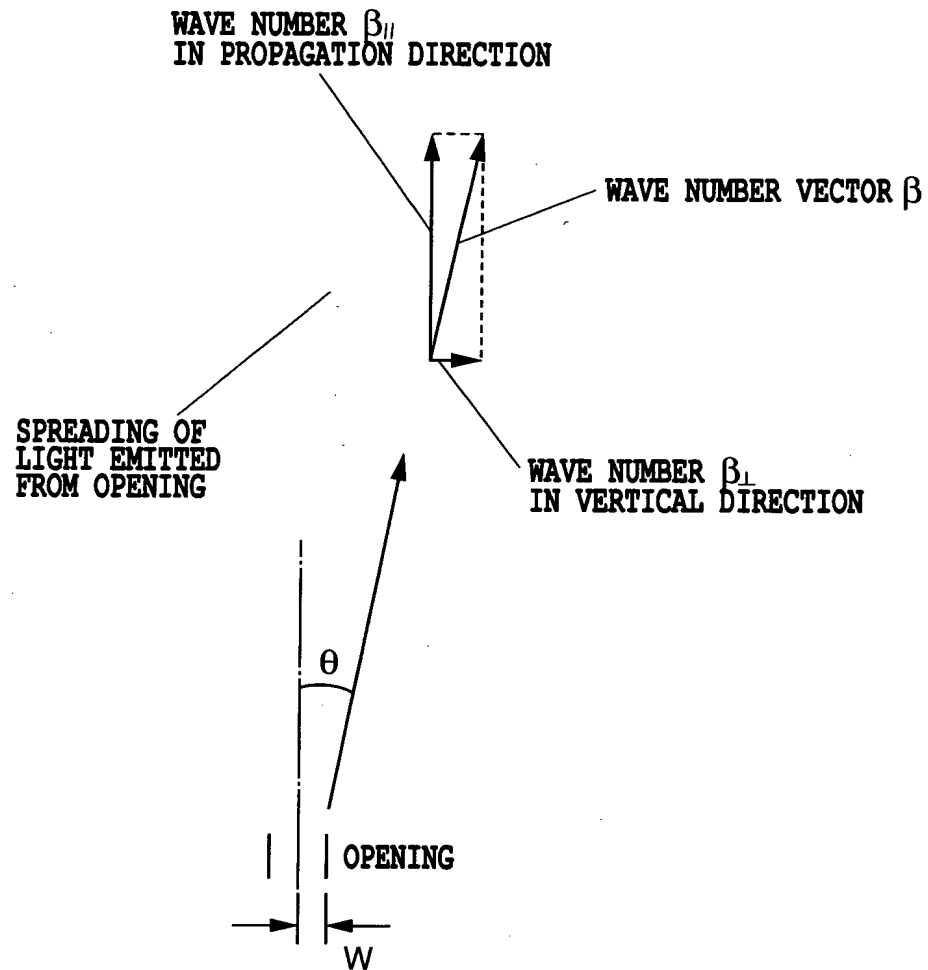


FIG.30

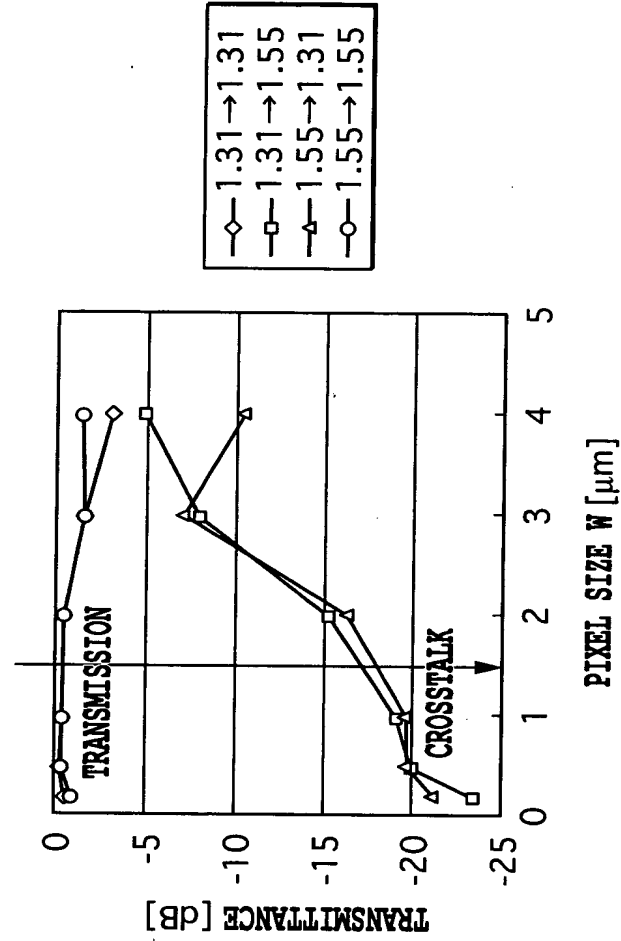


FIG.31B

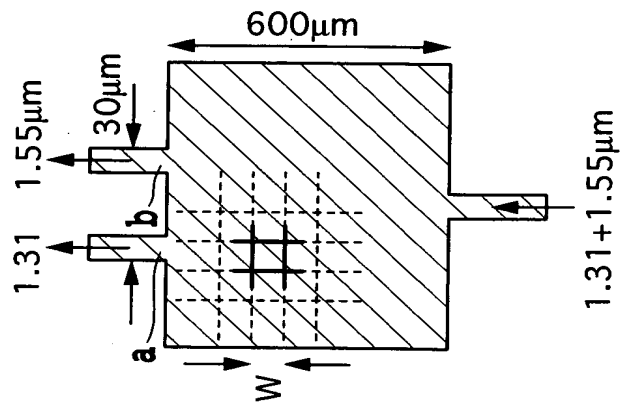


FIG.31A

32/70

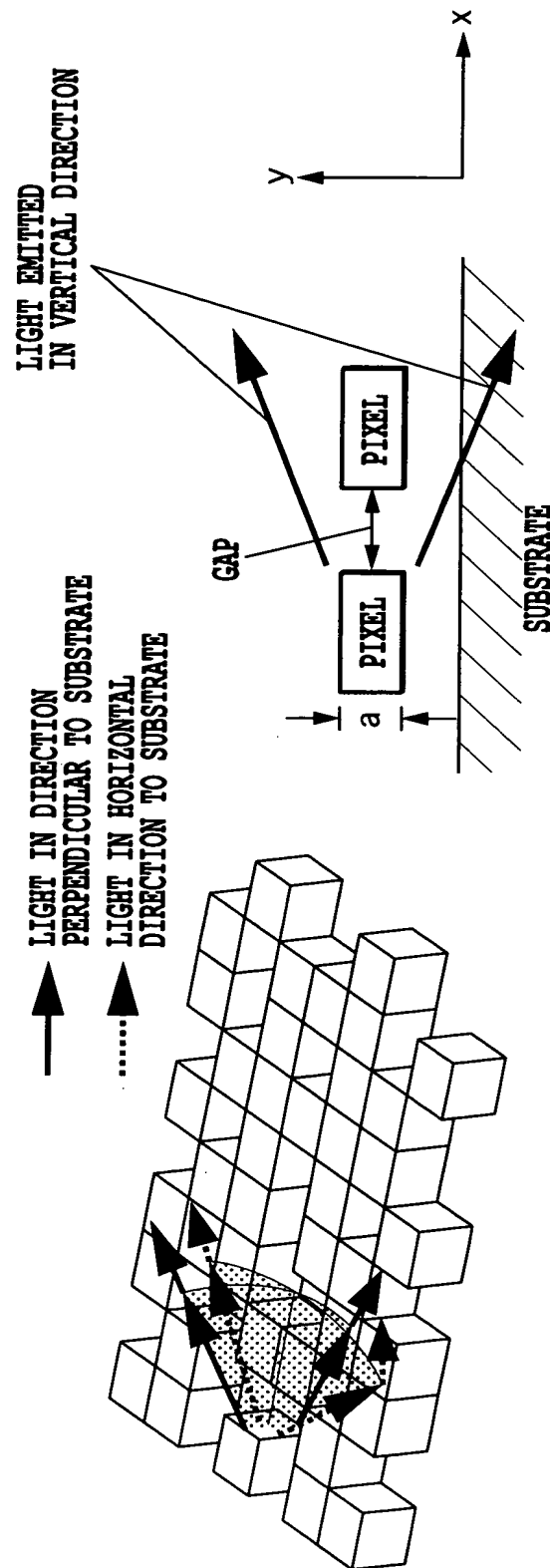


FIG. 32B

FIG. 32A

Title: WAVE TRANSMISSION MEDIUM AND WAVEGUIDE CIRCUIT

Inventors: Toshikazu Hashimoto et al.

Docket No. 14321.78

33/70

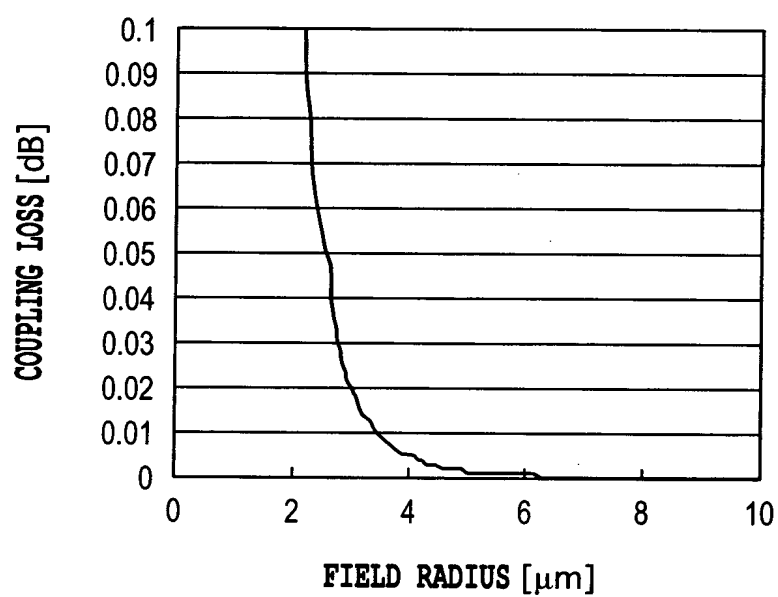
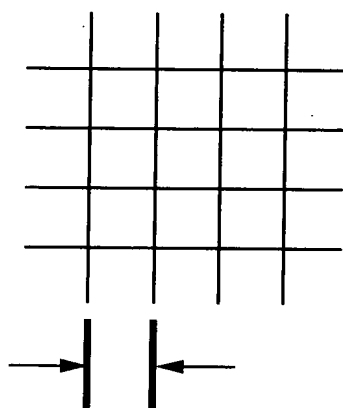
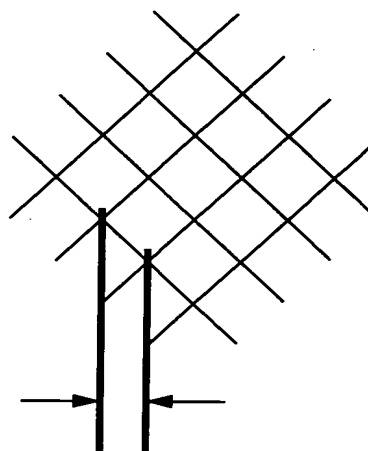


FIG.33



NORMAL PIXEL
ARRANGEMENT

FIG.34A



PIXEL ARRANGEMENT
IN THIS EMBODIMENT

LIGHT
PROPAGATION
DIRECTION


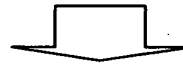
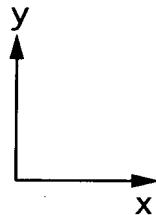
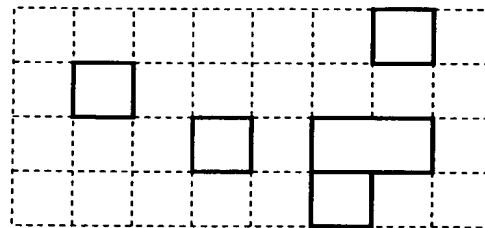


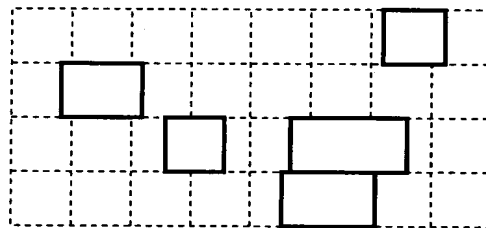
FIG.34B

FIG.35A



POSITION IN LATERAL
DIRECTION IS ARBITRARY
AS FAR AS PATTERN
SATISFIES MINIMUM PATTERN RULE

FIG.35B



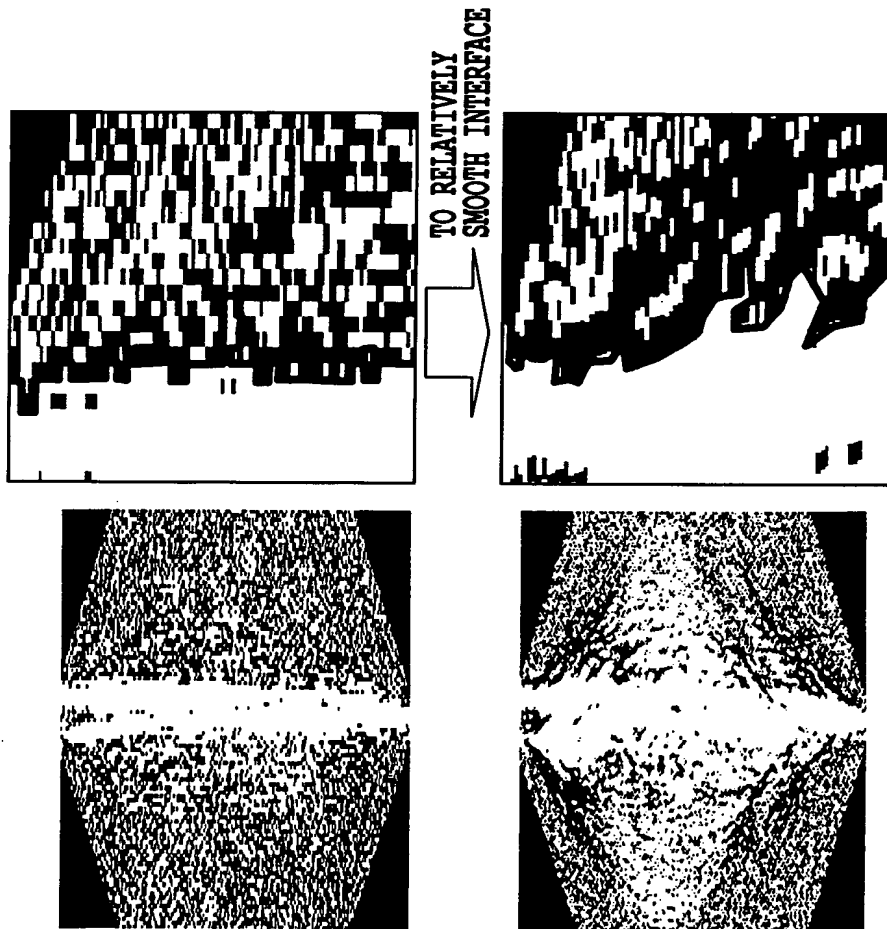


FIG.36A

FIG.36B

37/70

FIG.37A

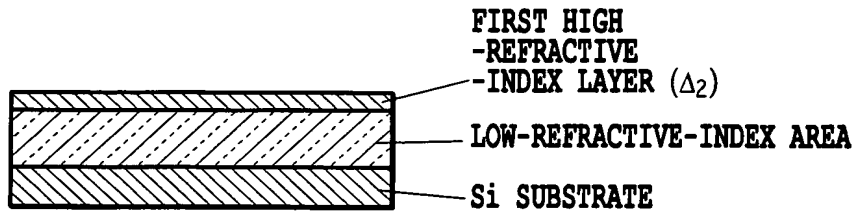


FIG.37B

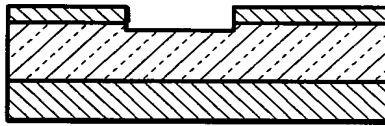
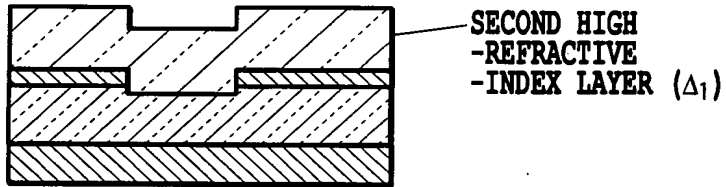


FIG.37C



38/70

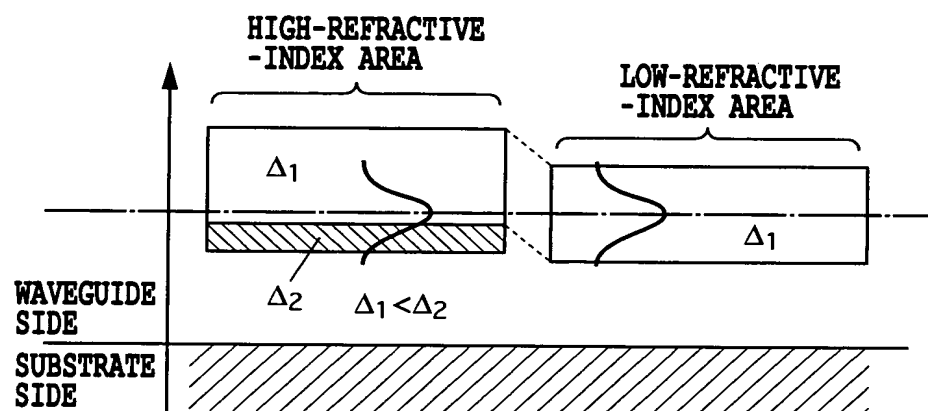
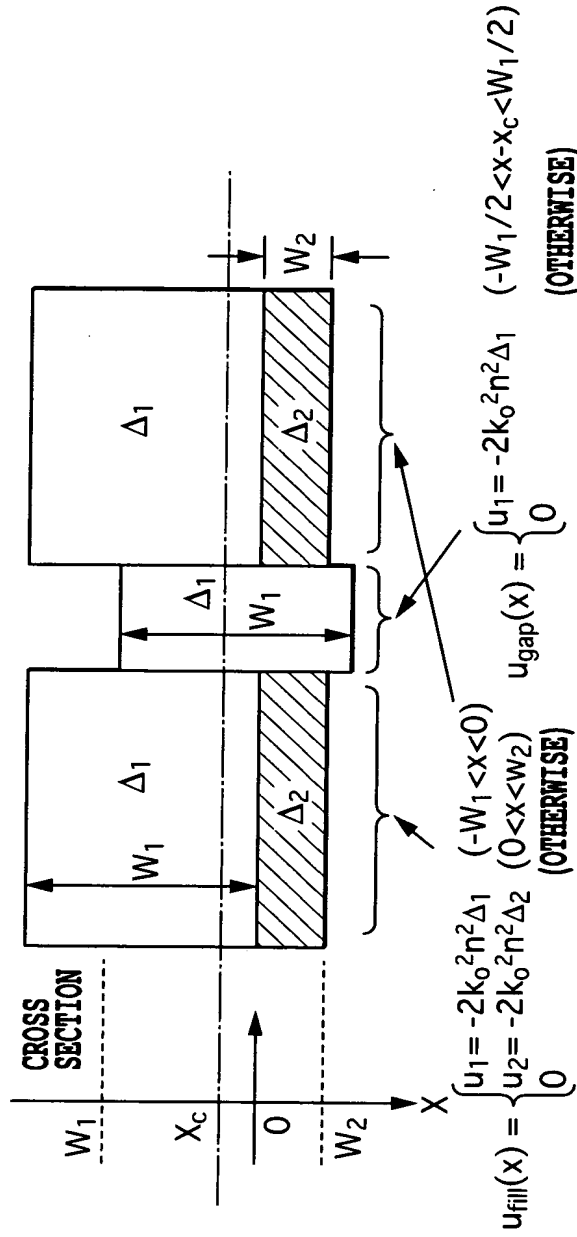


FIG.38

39/70



VARIATIONAL EQUATION
(THREE EQUATIONS)

$$\begin{cases} \frac{\partial R_{\text{gap}}}{\partial W} = 0 \\ \frac{\partial R_{\text{fill}}}{\partial W} = 0 \\ \frac{\partial R_{\text{fill}}}{\partial W_c} = 0 \end{cases}$$

$$H_j \equiv -\left(\frac{\partial}{\partial x}\right)^2 + u_j(x) \quad (j = \text{fill, gap})$$

$$g(x-x_c) \equiv \sqrt{\frac{2}{\pi p^2}} \exp\left[-\left(\frac{x-x_c}{w^2}\right)^2\right]$$

$$R_{\text{gap}} \equiv \int_{-\infty}^{\infty} g(x-x_c) H_{\text{gap}} g(x-x_c) dx = \left(\frac{1}{W^2}\right) + u_1 \operatorname{erf}\left(\sqrt{\frac{W_1}{2W}}\right)$$

$$R_{\text{fill}} \equiv \int_{-\infty}^{\infty} g(x-x_c) H_{\text{fill}} g(x-x_c) dx = \frac{1}{W^2} + \frac{1}{2} \left[u_1 \operatorname{erf}\left(\sqrt{2} \frac{W_1 + X_c}{W}\right) + u_2 \operatorname{erf}\left(\sqrt{2} \frac{W_2 - X_c}{W}\right) + (u_2 - u_1) \operatorname{erf}\left(\sqrt{2} \frac{X_c}{W}\right) \right]$$

FIG.39

Title: WAVE TRANSMISSION MEDIUM AND WAVEGUIDE CIRCUIT

Inventors: Toshikazu Hashimoto et al.

Docket No. 14321.78

40/70

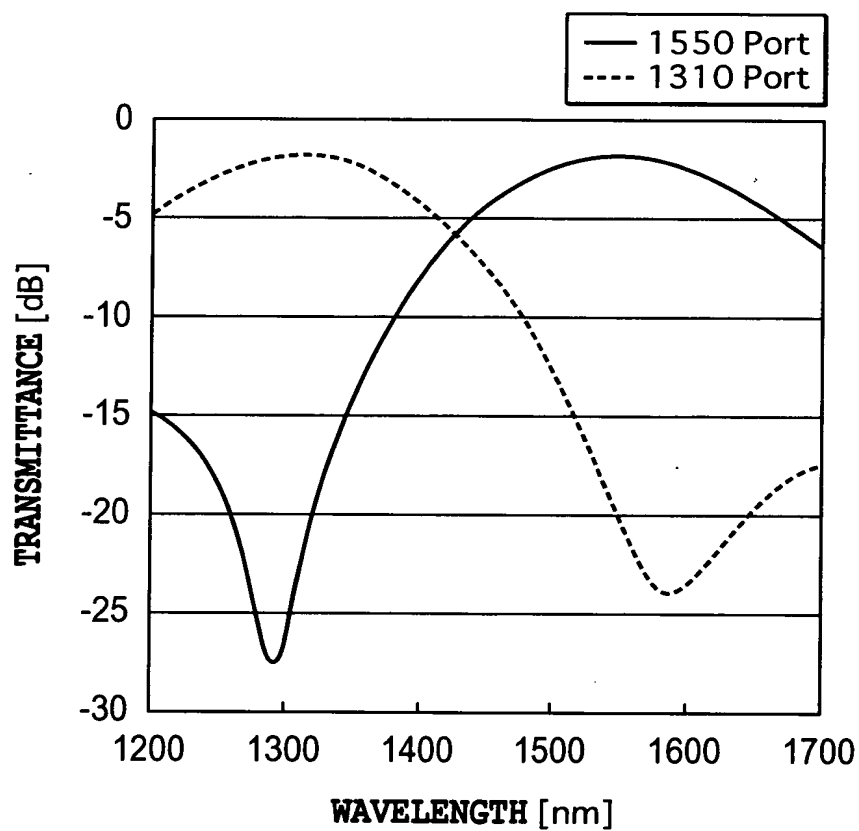


FIG.40

FIG.41A

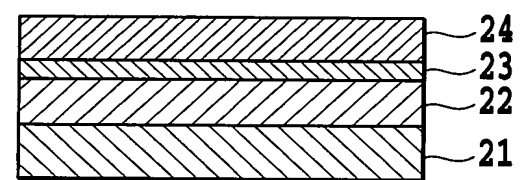


FIG.41B

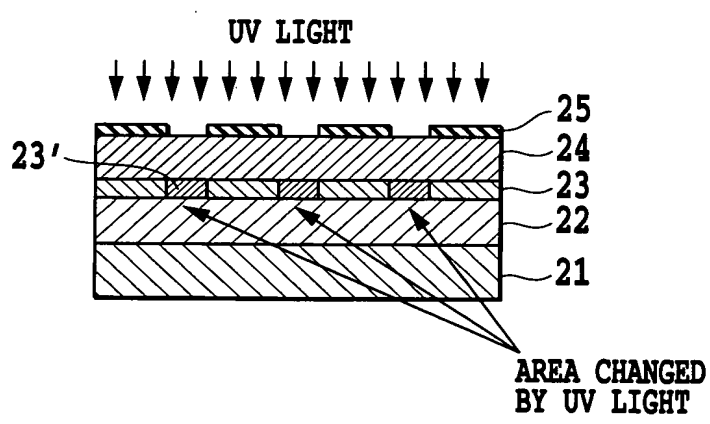


FIG.42A

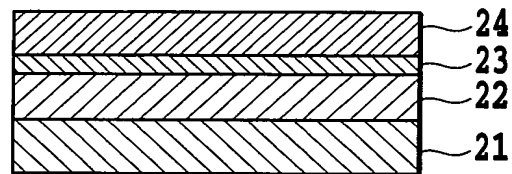


FIG.42B

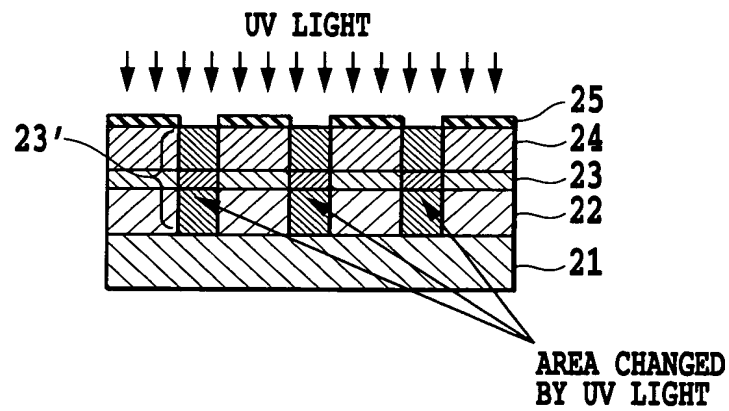


FIG.43A

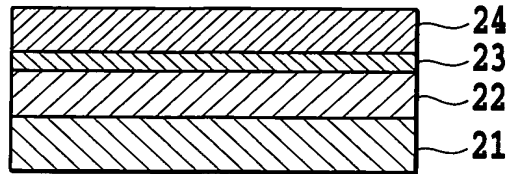


FIG.43B

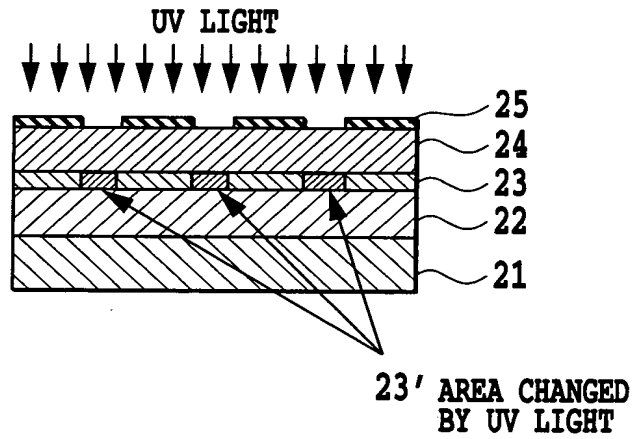


FIG.43C

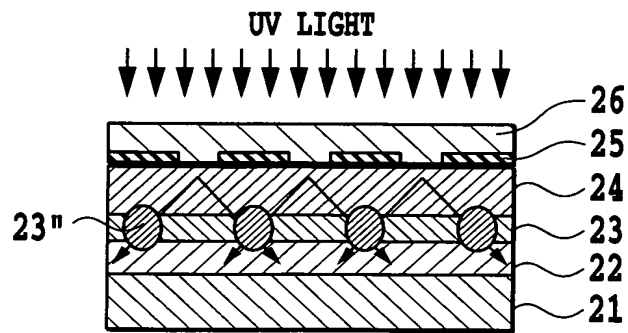


FIG.43D

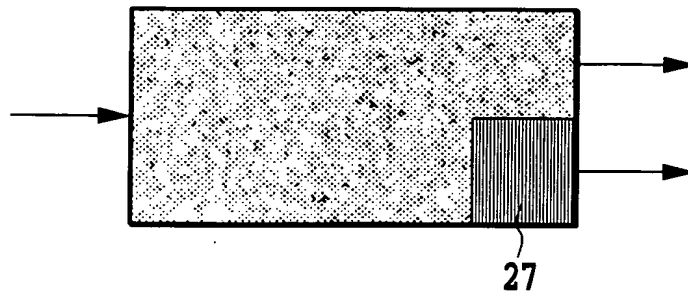


FIG.44A

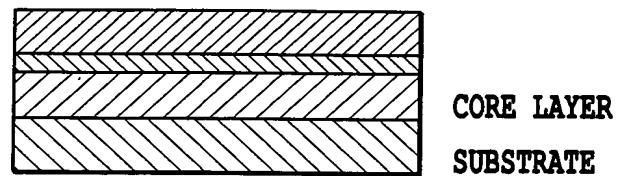


FIG.44B

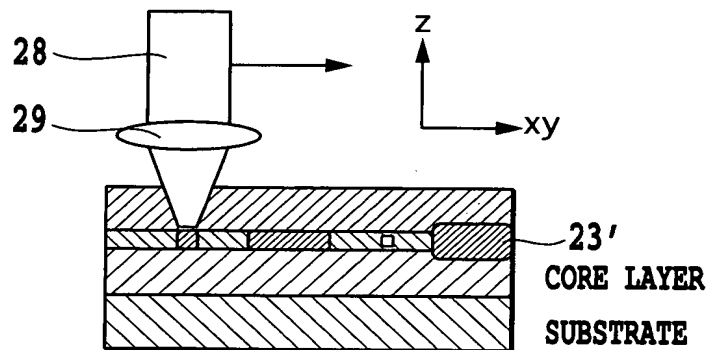


FIG.45A

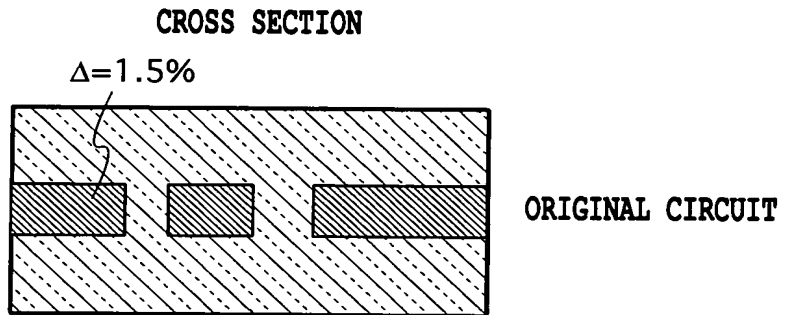


FIG.45B

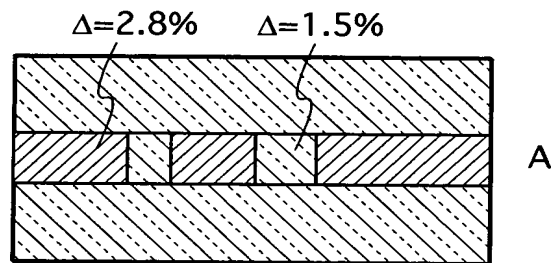
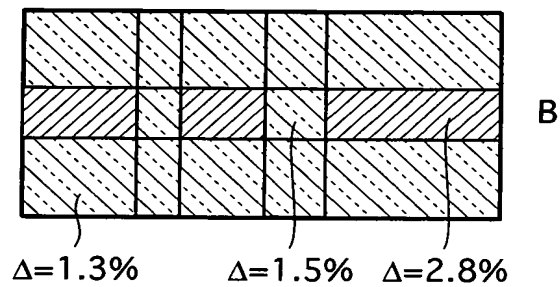
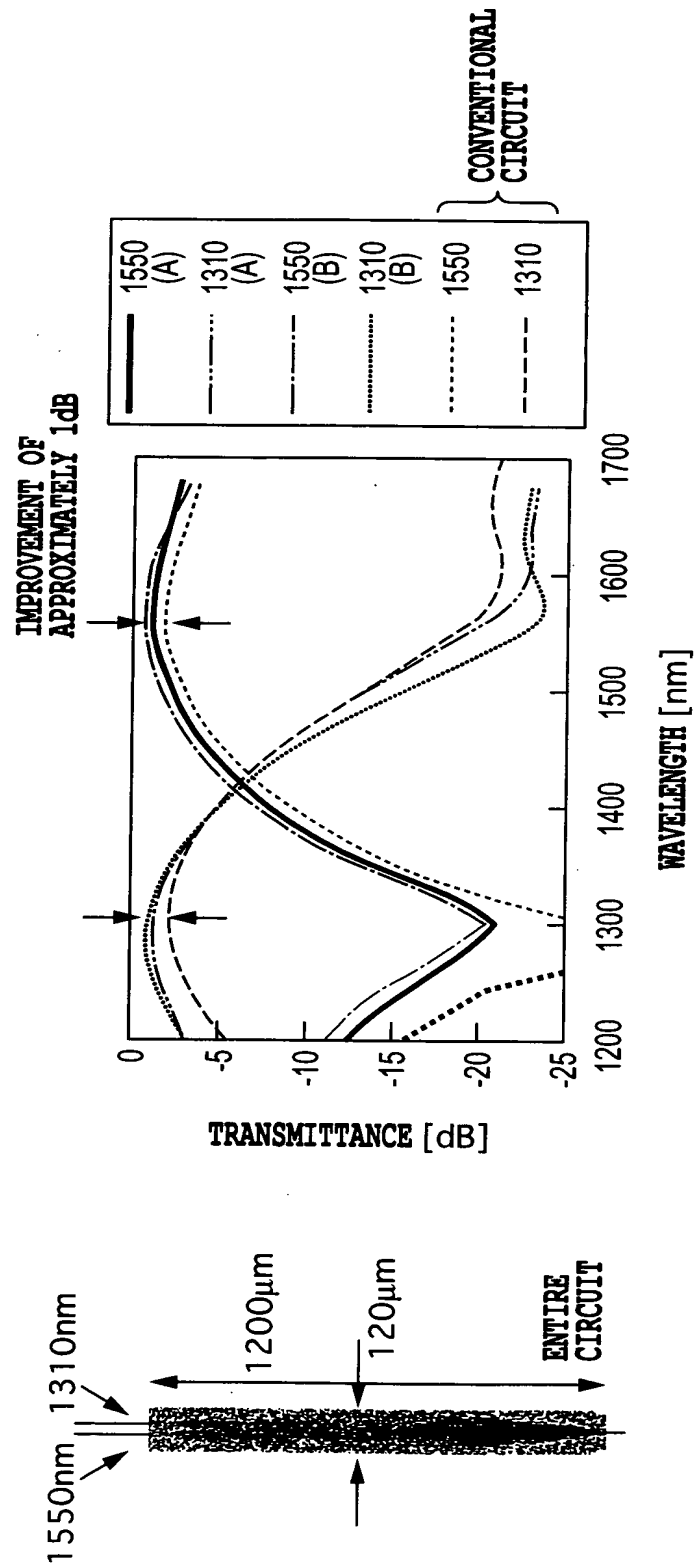


FIG.45C





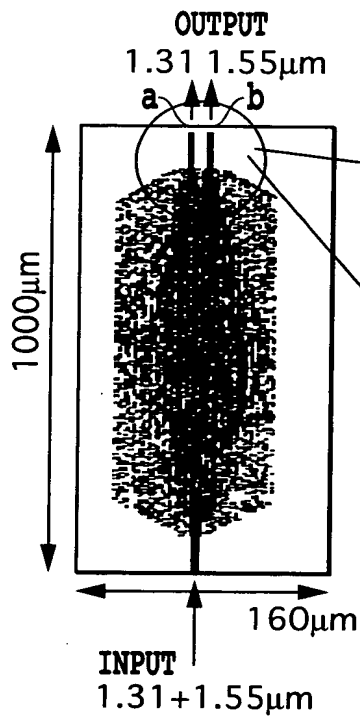


FIG. 47A

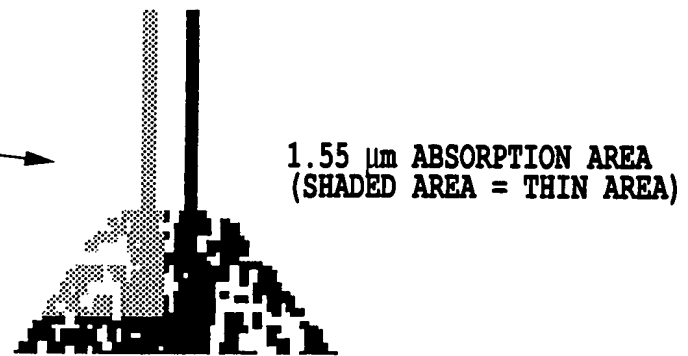


FIG. 47B

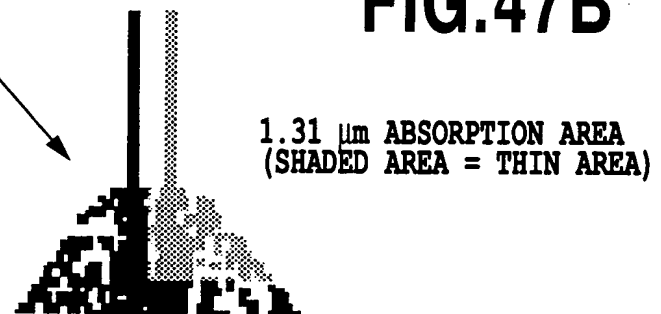


FIG. 47C

UPWARD
DIRECTION OF
SUBSTRATE

FIG.48A

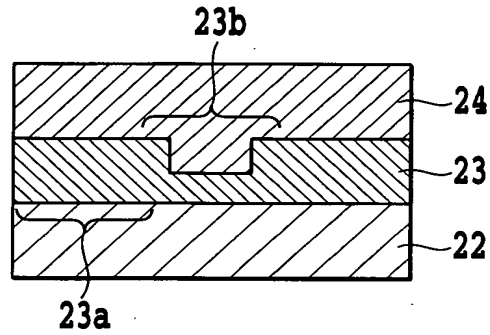


FIG.48B

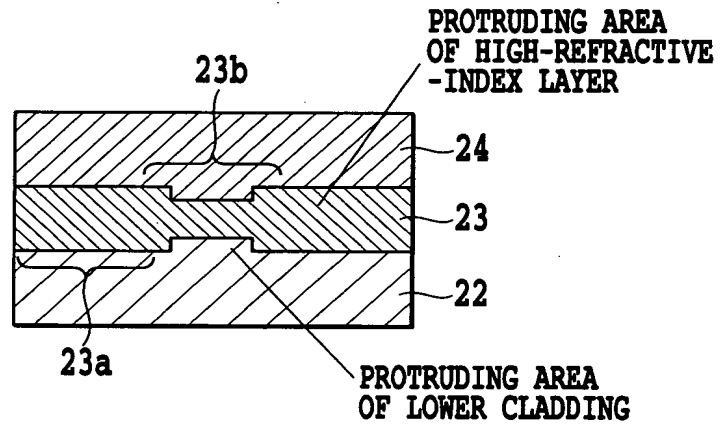
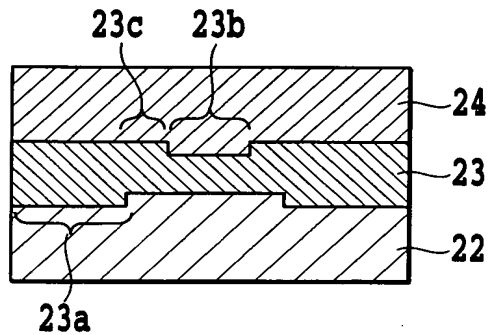


FIG.48C



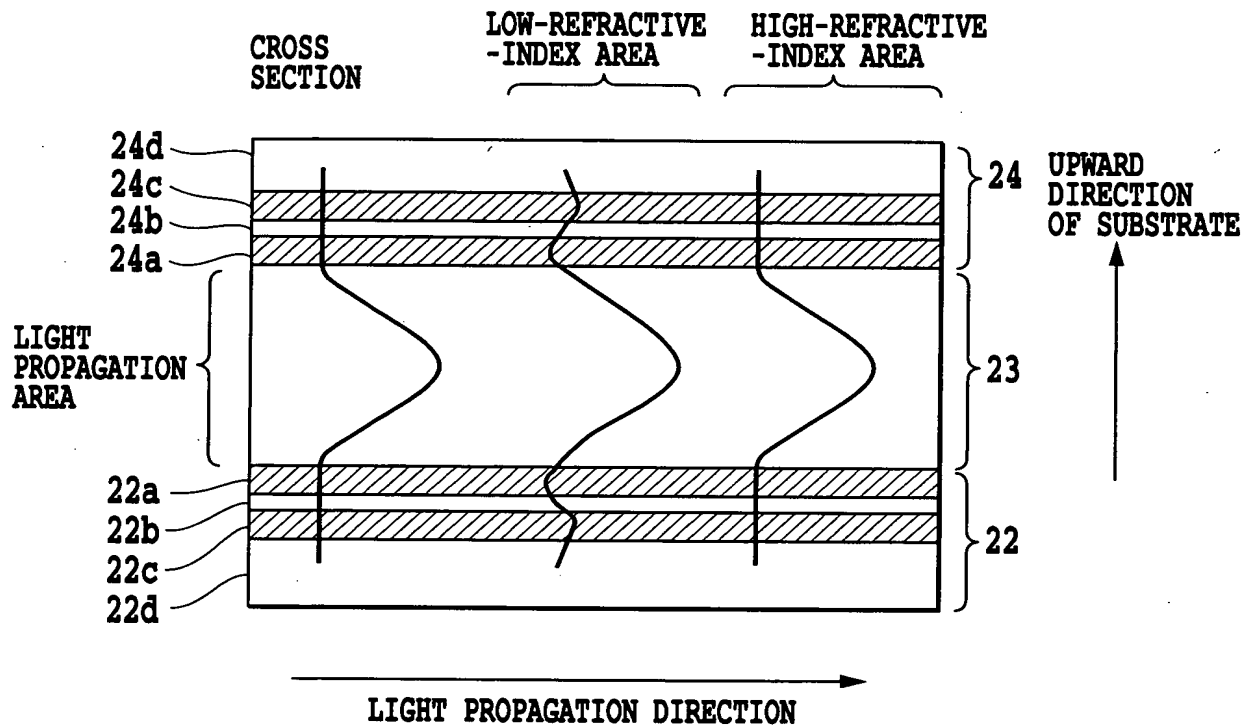
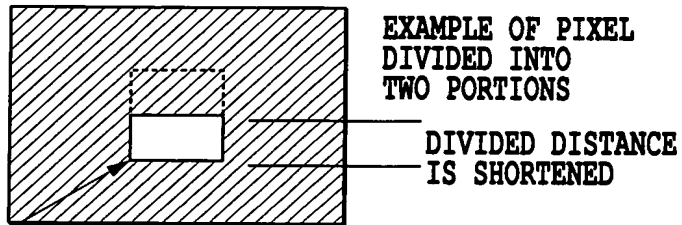


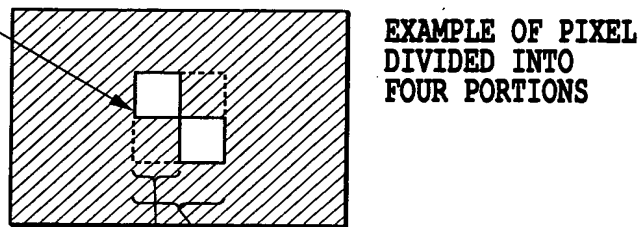
FIG.49

FIG.50A



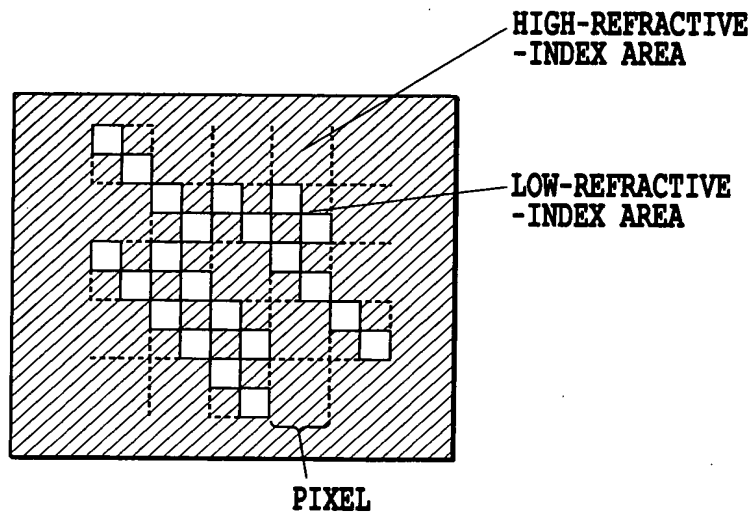
EFFECTIVELY
LOW-REFRACTIVE
INDEX

FIG.50B



PIXEL
SUBPIXEL

FIG.50C



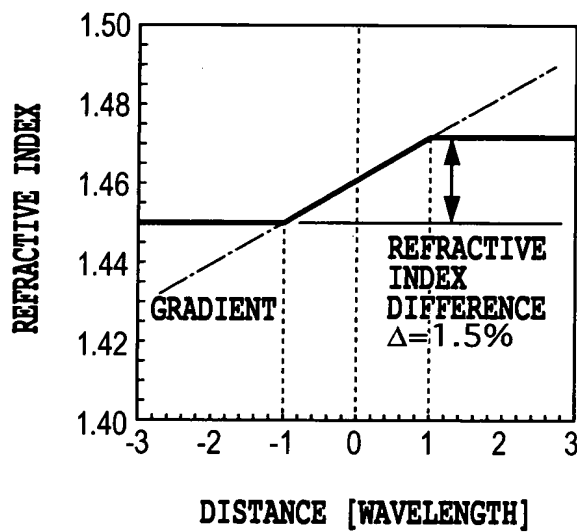
REFLECTION BY CHANGE IN PROPAGATION
DIRECTION OF EFFECTIVE PROPAGATION CONSTANT

FIG.51A

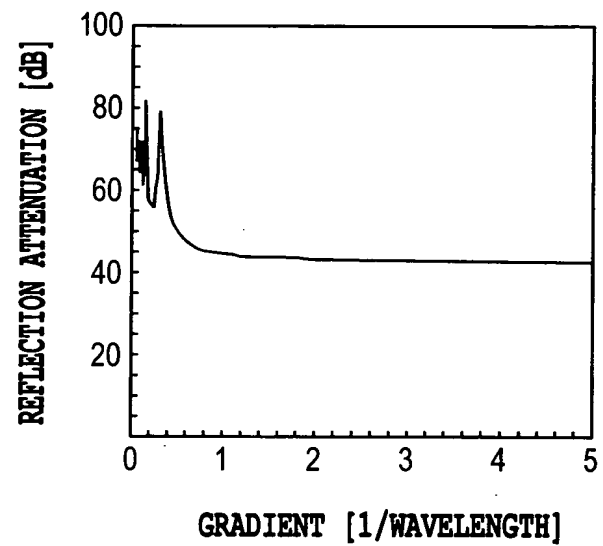


FIG.51B

52/70

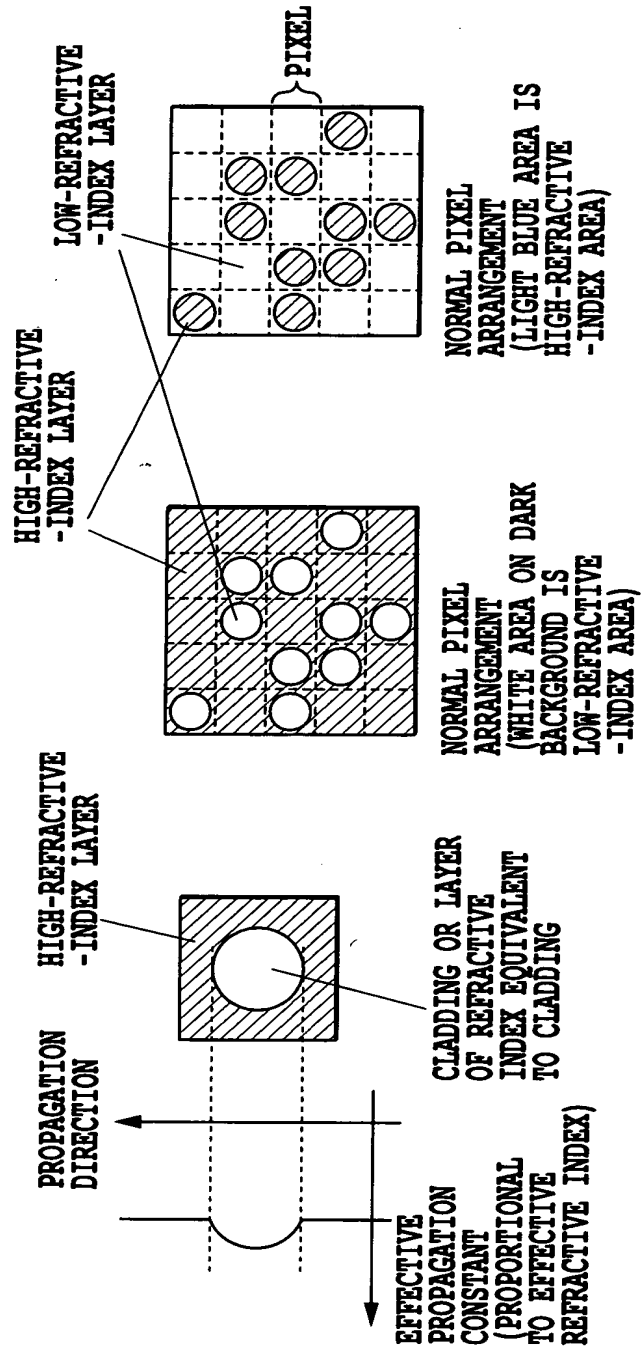


FIG. 52A

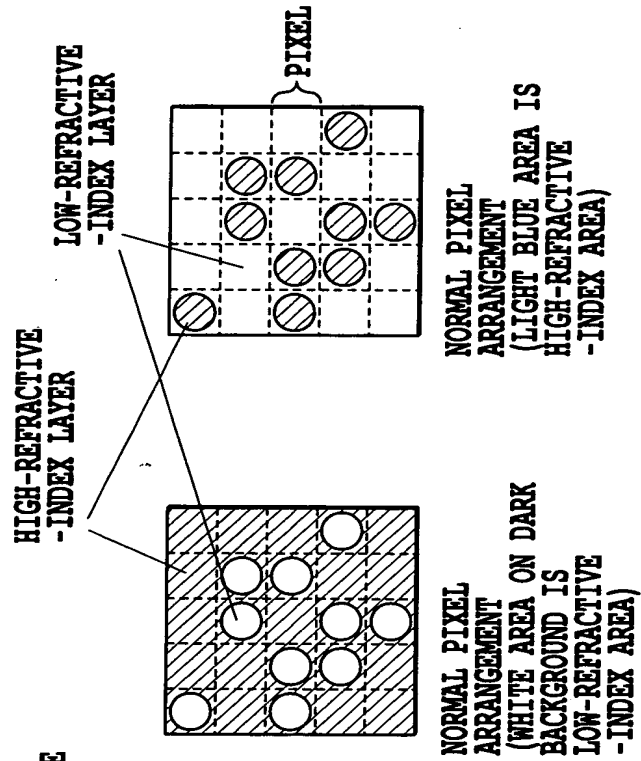


FIG. 52B

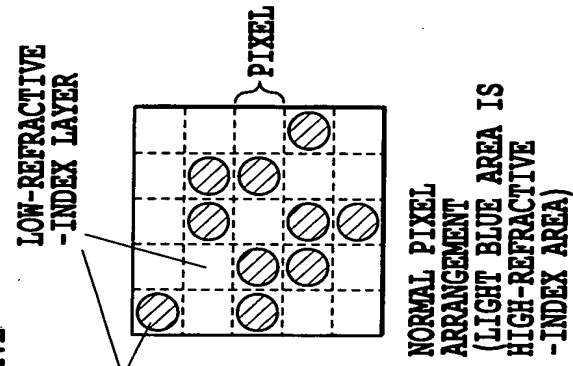


FIG. 52C

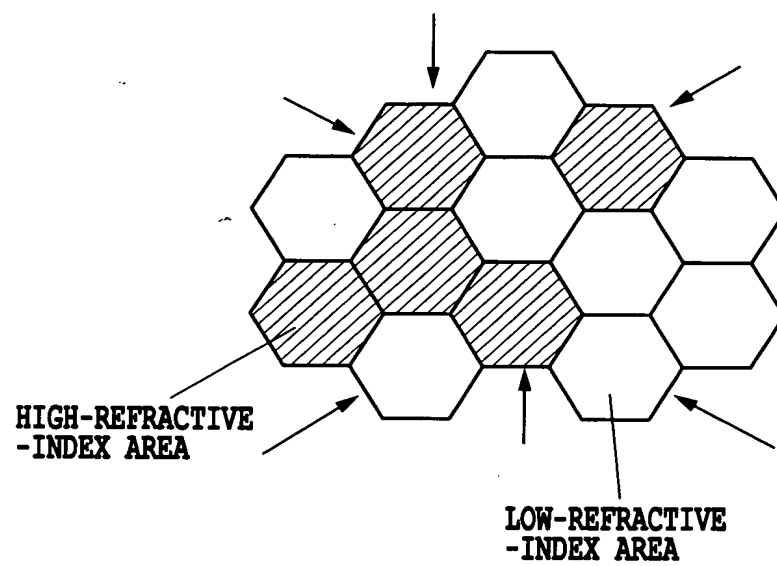


FIG.53

Title: WAVE TRANSMISSION MEDIUM AND WAVEGUIDE CIRCUIT

Inventors: Toshikazu Hashimoto et al.

Docket No. 14321.78

10/540734

54/70

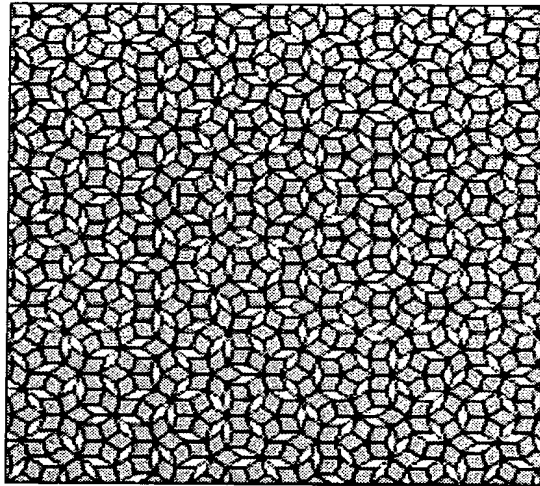


FIG.54

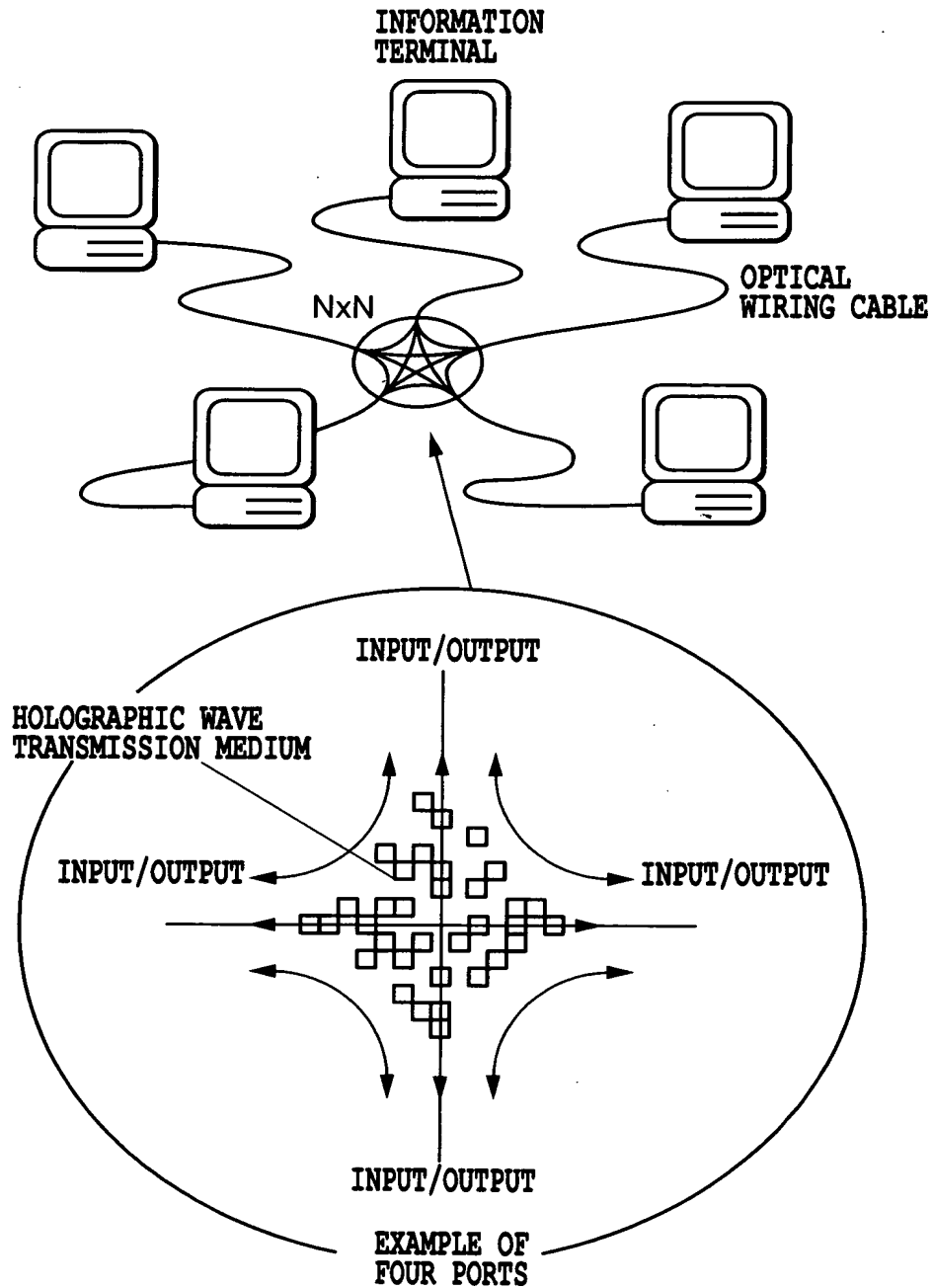


FIG.55

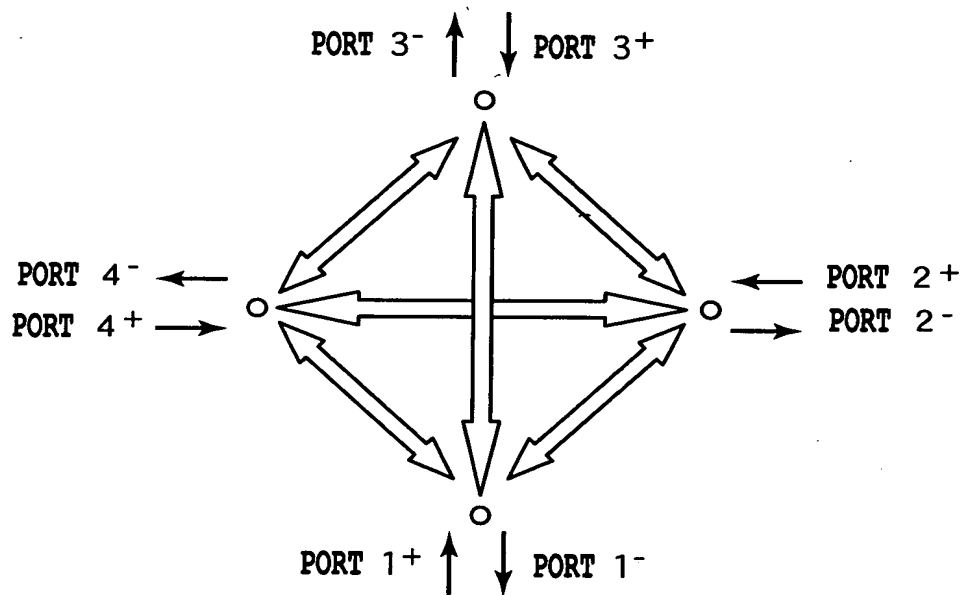


FIG.56

Title: WAVE TRANSMISSION MEDIUM AND WAVEGUIDE CIRCUIT

Inventors: Toshikazu Hashimoto et al.

Docket No. 14321.78

57/70

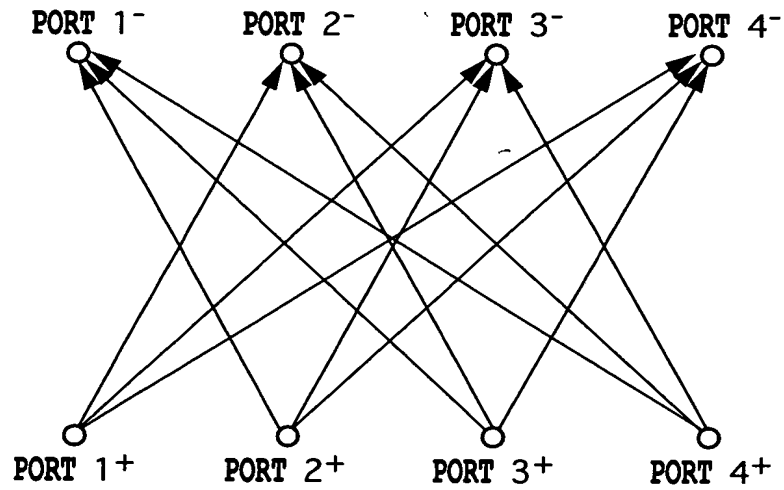


FIG.57

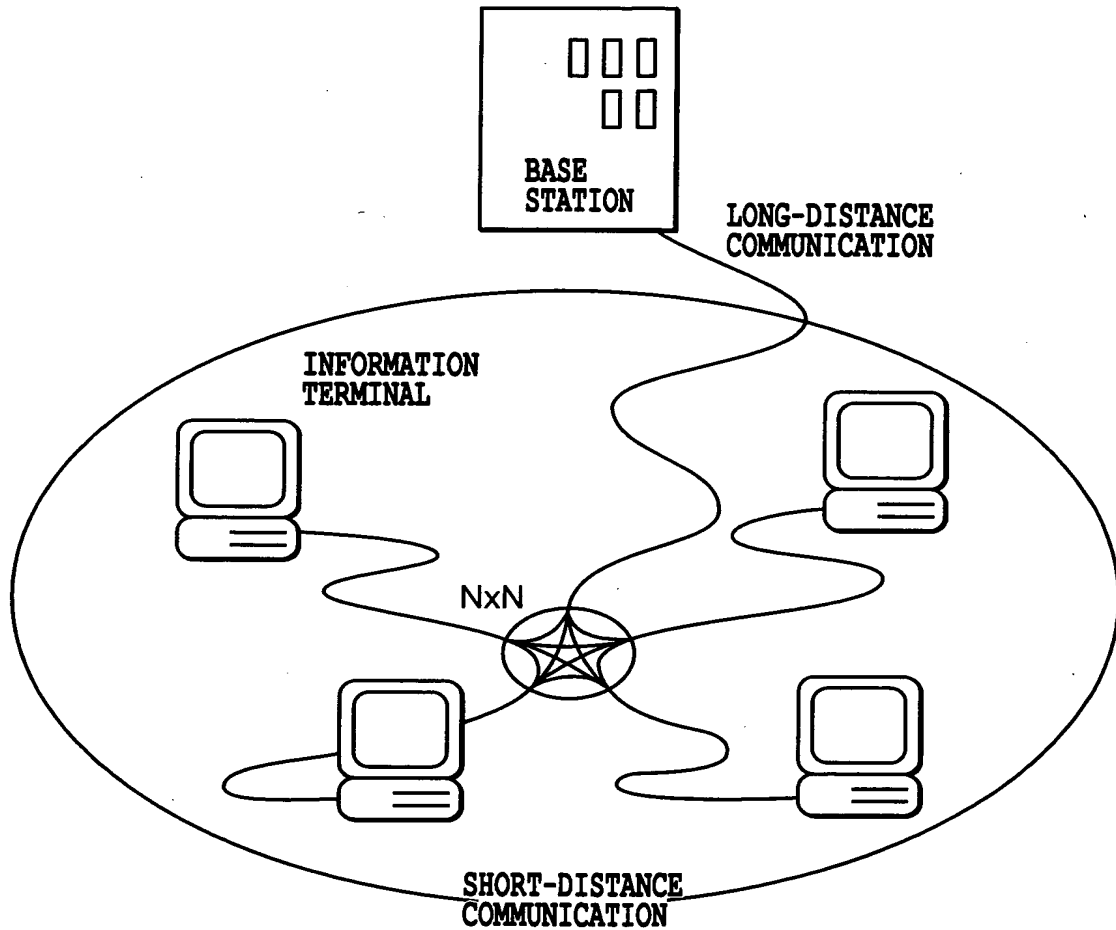


FIG.58

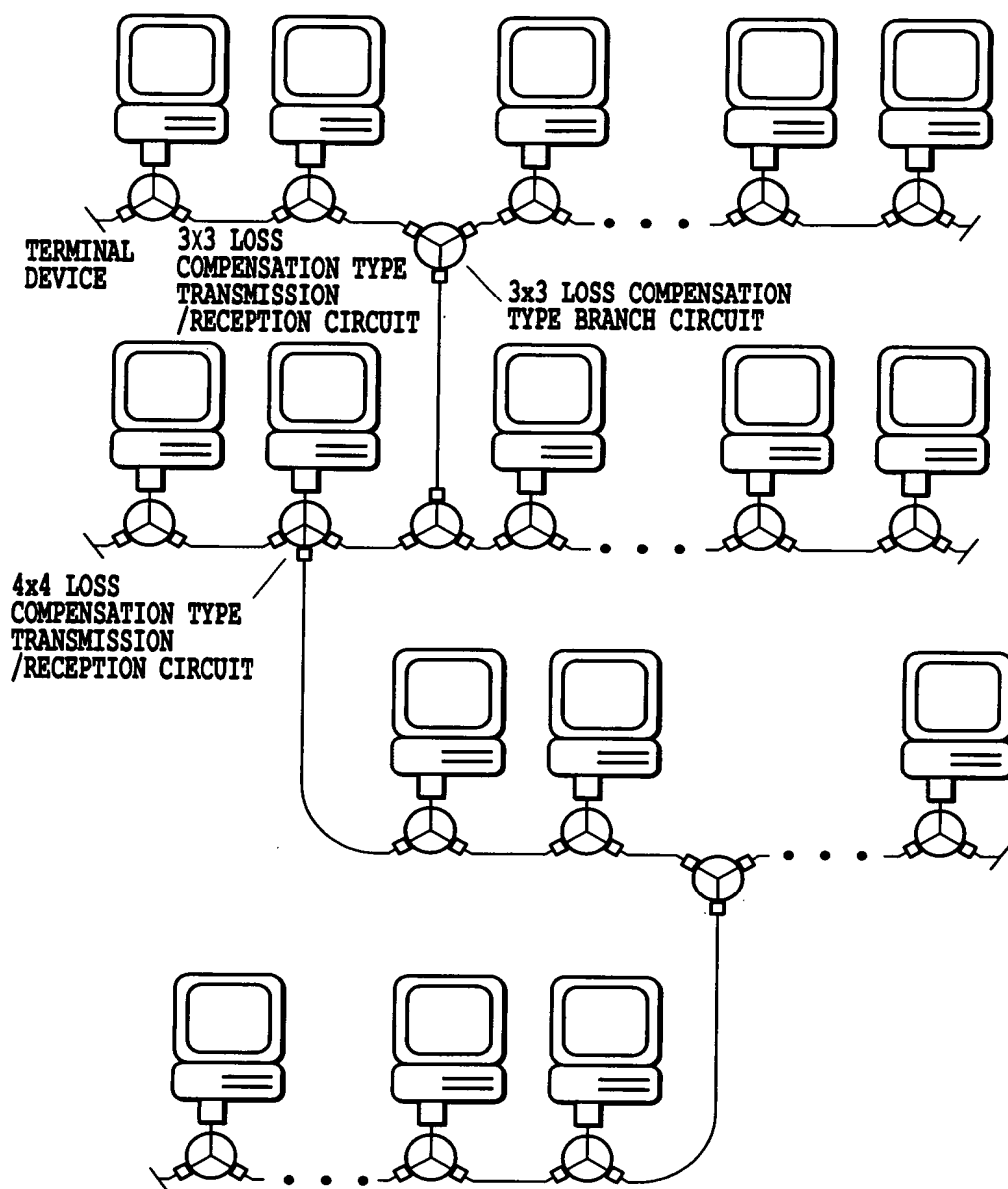


FIG.59

60/70

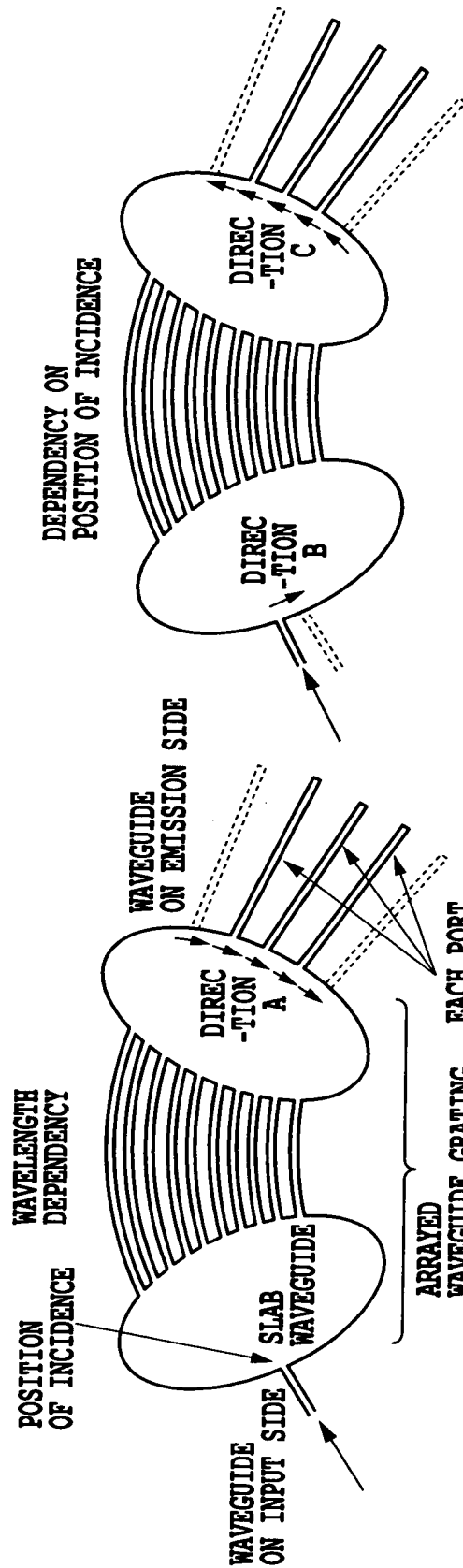


FIG. 60A

FIG. 60B

Title: WAVE TRANSMISSION MEDIUM AND WAVEGUIDE CIRCUIT

Inventors: Toshikazu Hashimoto et al.

Docket No. 14321.78

61/70

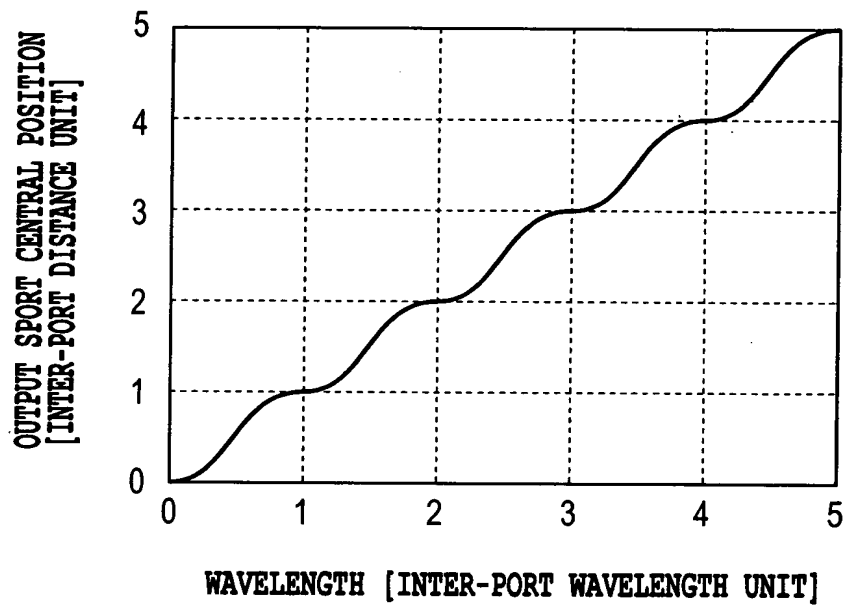


FIG.61

62/70

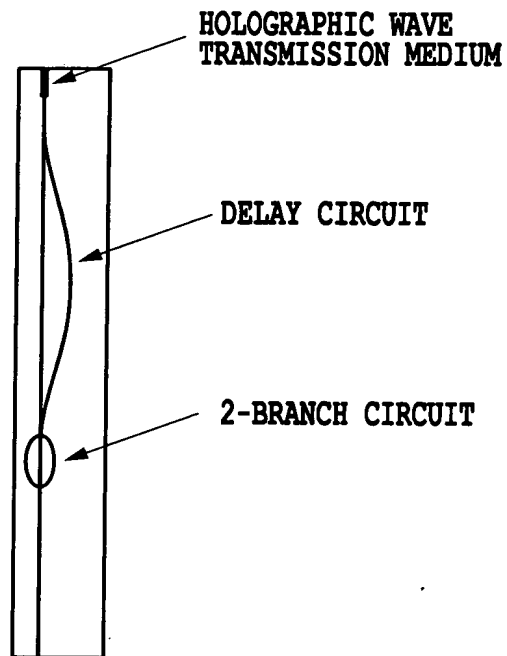


FIG.62

63/70

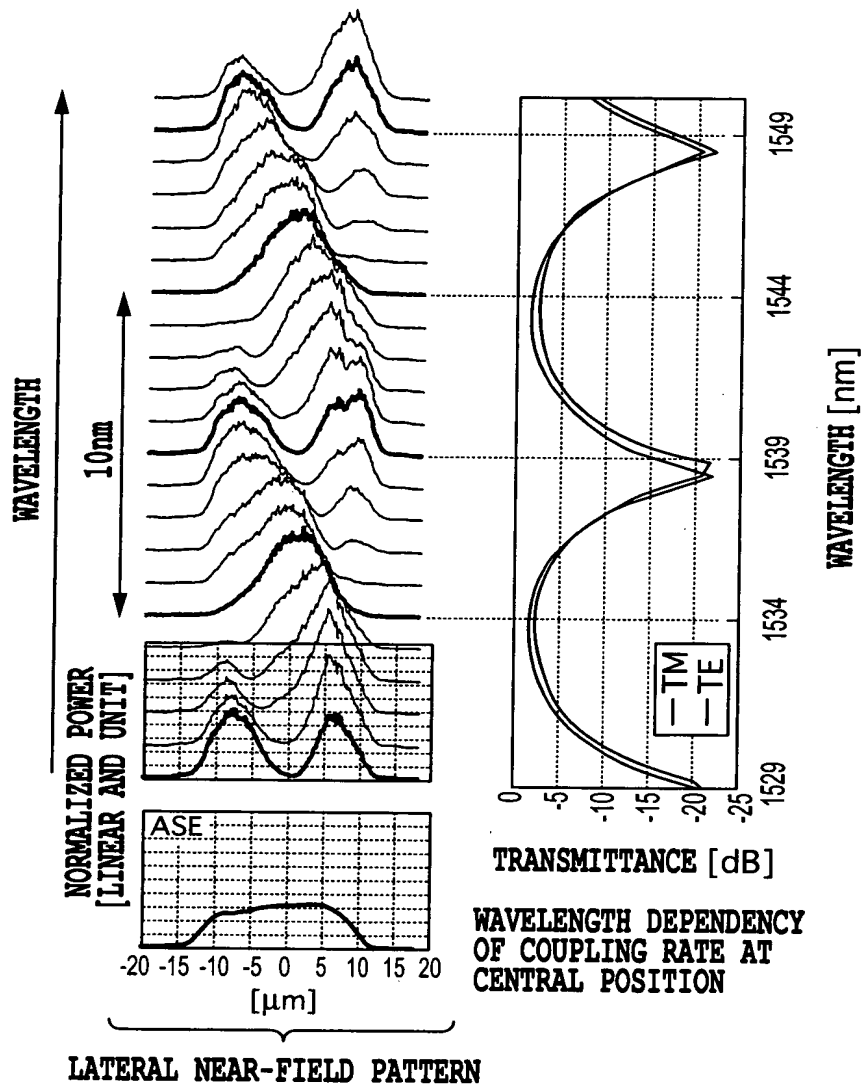


FIG.63

64/70

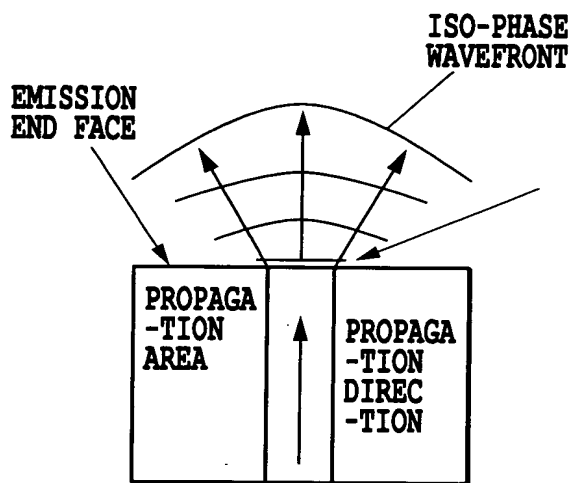


FIG. 64A

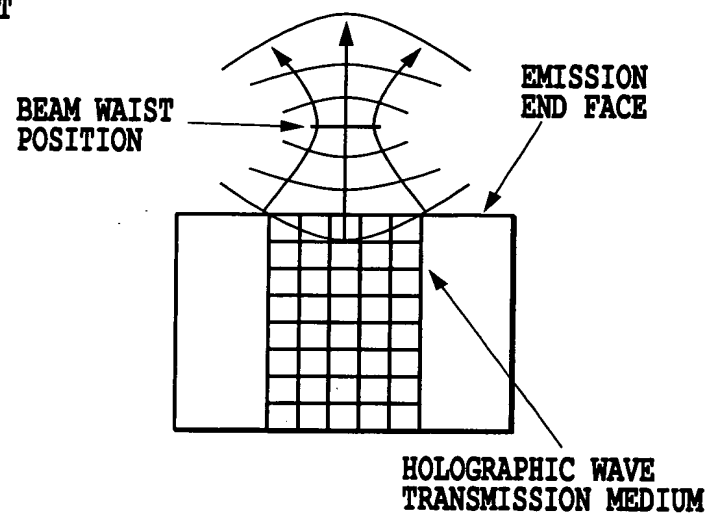


FIG. 64B

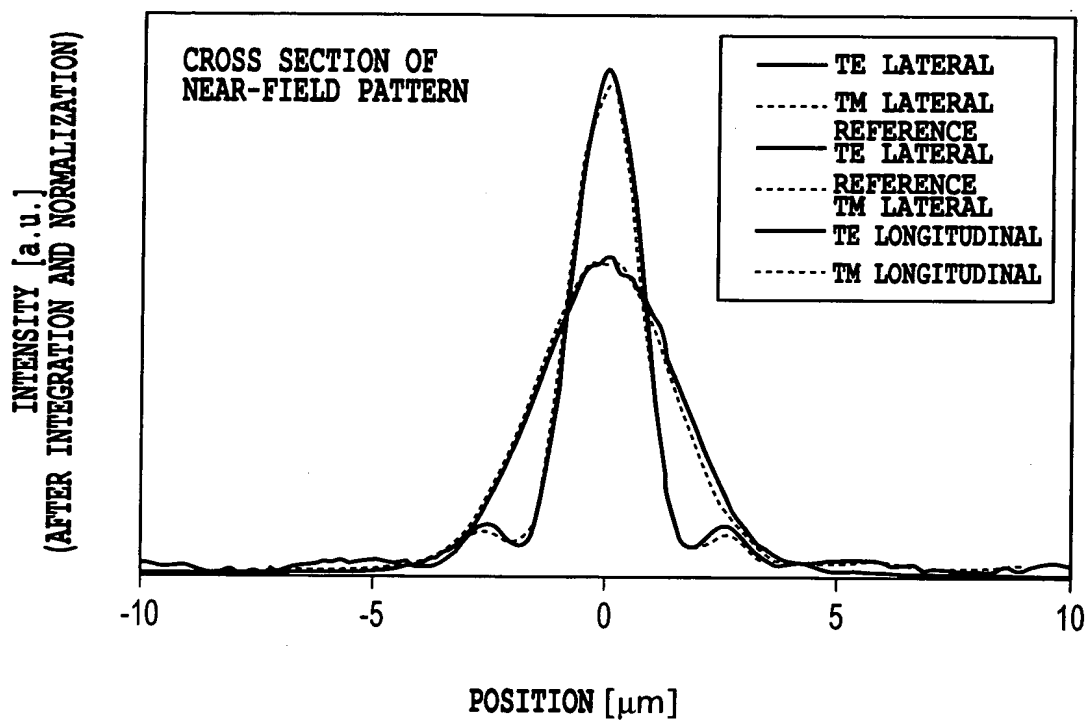


FIG.65

66/70

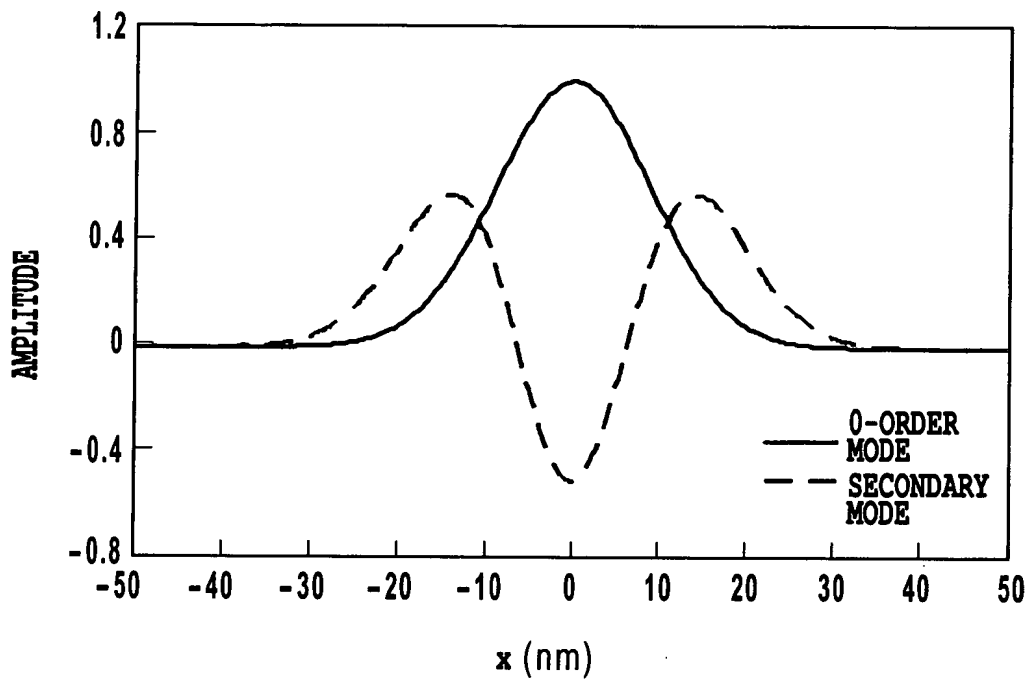


FIG.66

FIG.67A

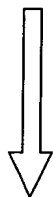
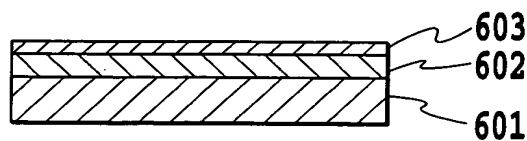


FIG.67B

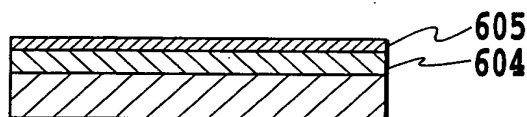


FIG.67C

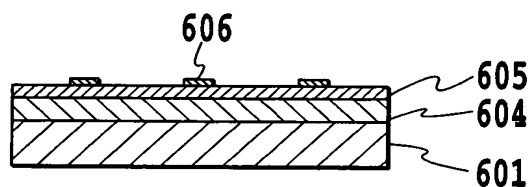


FIG.67D

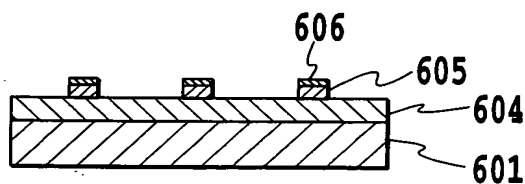
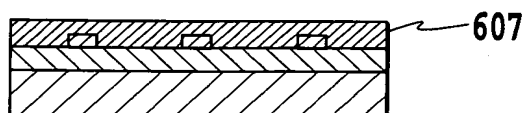


FIG.67E



Title: WAVE TRANSMISSION MEDIUM AND WAVEGUIDE CIRCUIT

Inventors: Toshikazu Hashimoto et al.

Docket No. 14321.78

10/540734

68/70



FIG.68

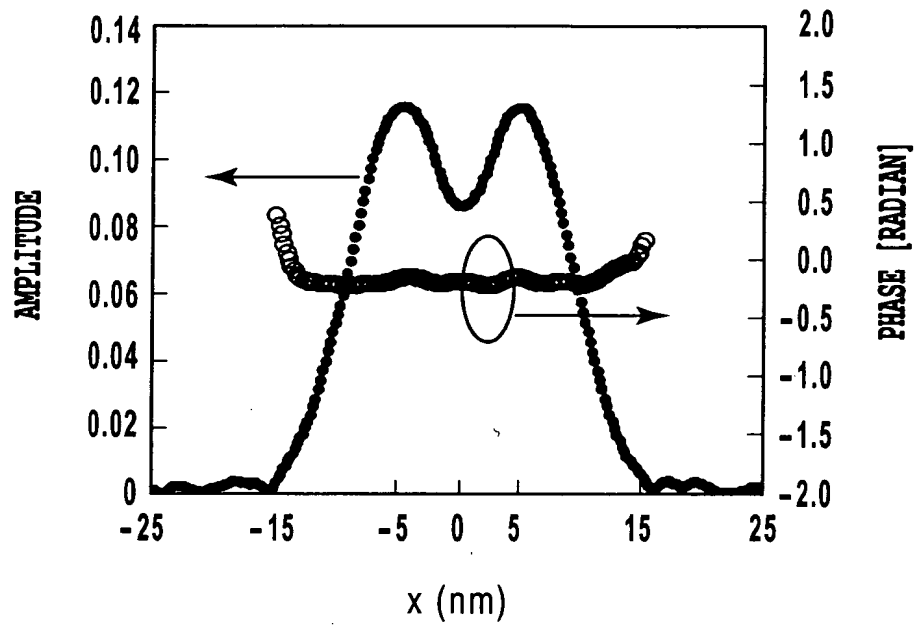


FIG.69

70/70

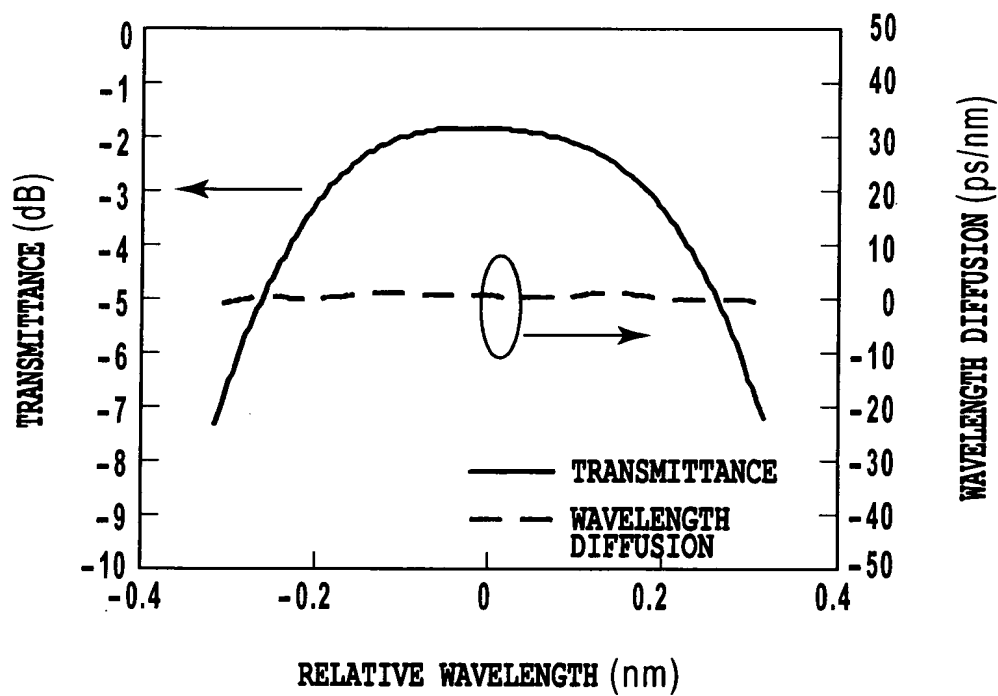


FIG.70

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